



# NEW YORK CITY BUILDING CODE

2014 New York City Building Code  
Effective October 1, 2014  
Including all amendments up to Local Law 33 of 2014

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# DEDICATION

The *New York City Construction Codes* reflect the work of many, many people and organizations. The story of the code development, detailed in the following pages, barely scratches the surface of the passion, determination, and focus that launched and kept the effort going from beginning to end. We dedicate this publication of the *New York City Construction Codes* to two very special people in our code family: Matthew Sapolin, the former Commissioner of the Mayor's Office for People with Disabilities, and Fatma M. Amer, PE, the former First Deputy Commissioner at the Department of Buildings. Both Matt and Fatma inspired us to complete this enormous endeavor. They shared the same enthusiasm for code, and had the ability to bridge divergent views in a way that seemed to reflect everyone's interests. Everyone was a winner if they worked with either of these two dynamic individuals. Despite all the hard work, they made you laugh and they made you feel like you were a part of something special. Their fingerprints are found throughout the pages of these codes.

Fatma retired from the Department in April 2011. We miss her, and wish her well in all the new and exciting endeavors that await her.

In November 2011, we were all shocked and saddened by the passing of our friend and colleague, Matthew Sapolin. Matt chaired the Accessibility Committee during the 2008 and 2014 code revision efforts. He believed that through our efforts we worked to make the City better by making buildings accessible to people of all abilities. His humor and his enthusiasm are remembered and missed.

And so, we thank Fatma and remember Matt, and dedicate this publication of the *New York City Construction Codes* in her honor, and his memory.

James P. Colgate, RA, Esq.  
Assistant Commissioner  
Technical Affairs &  
Code Development

Helen M. Gitelson  
Executive Director  
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# NEW YORK CITY CONSTRUCTION CODES

## PREFACE

### Background

The 2014 *New York City Construction Codes*, effective October 1, 2014, are patterned after the family of model construction codes published by the International Code Council (ICC). While the ICC Codes, with their interpretive commentary and history of amendments, will in the future be a rich new source for interpreting the City's building laws, New York City has extensively modified the ICC text. As modified, the provisions incorporate the collective wisdom of more than 350 years of building regulation in the City.

New York City was the first jurisdiction in the country to experience the problems associated with building construction in a high-density urban environment and the first to attempt to solve them through regulatory measures. In 1625, the Dutch West India Company established rules for the types and locations of houses that could be built in the colony of New Amsterdam. This early attempt at meeting public safety and sanitation needs would evolve into one of the most comprehensive building codes in the United States.

Based initially on fire prevention principles, the City's regulations evolved into provisions governing sanitation and building construction and materials. From their start in the late 17th century, to creation of the position of "Superintendent of Buildings" within the Fire Department in 1860, to creation of a citywide Department of Buildings in 1936, through comprehensive revisions in 1938, 1968 and 2008, the City's building code grew to become one of the most stringent in the nation. The 1938 revisions were geared toward capturing provisions to meet the needs of new skyscrapers and multiple dwellings. The 1968 revisions were designed to incorporate new technologies and building practices, including performance criteria for building construction.

After the collapse of the World Trade Centers in 2001, the City recognized the need to comprehensively review and modernize the 1968 *Building Code* to bring construction requirements up to date. Acting upon the recommendations of the Mayor's 2003 Advisory Commission, the NYC Model Code Program was born, housed in, and supported by the City's Department of Buildings ("Department"). This multi-year effort resulted in the adoption, in modified form, of the 2003 edition of the ICC's family of codes. The Department organized more than 400 industry stakeholders into technical, advisory and managing committees. Committee members included: architects; engineers; planners; and representatives of building owners, labor, affordable housing and government. These committees reviewed the entire 1968 *Building Code* and compared it with the 2003 editions of the *International Building Code*® (IBC®), *International Mechanical Code*® (IMC®), *International Fuel Gas Code*® (IFGC®) and *International Plumbing Code*® (IPC®), known as I-Codes®, to identify the "new" code provisions. This work culminated in the passage of Local Law 99 of 2005 and Local Law 33 of 2007, also known as the 2008 *New York City Construction Codes*. An important feature of the legislation was the mandatory three-year revision cycle, a system designed to prevent code standards from becoming obsolete for want of timely revision. It is believed that if New York City's buildings are to continue to function as monuments of the City's ingenuity, vision, and expertise, its Construction Codes should do the same.

### The Code Development and Revision Process

The 2014 *New York City Construction Codes* is the first product of the periodic revision mandated by Local Law 33 of 2007. Once again the Department reached well beyond the agency's corridors to continue the public/private partnership of code development, involving more than 350 participants on 11 technical, advisory and managing committees. The Committee participants came from the architectural and engineering community, real estate, industry, labor, and government. They contributed more than 48,500 hours attending more than 255 technical, advisory, and managing committee meetings, as they pored over and developed new text and debated policy.

Many jurisdictions have adopted the I-Codes, but with fewer modifications than New York City. New York City is recognized as a unique and premiere urban environment, with no other American city matching the diversity of New York's built environment. From the canyons of Manhattan to the brownstones and houses of Brooklyn, Queens, the Bronx, and Staten Island, New York City poses a unique challenge for any building code. Because of this, the committees extensively reviewed and modified the I-Codes in many technical areas.

The Department used a consensus-based approach to propose changes to the 2008 *New York City Construction Codes*. These changes involved reviewing the 2008 *New York City Construction Codes* and the 2009 editions of the IBC, IMC, IFGC and IPC. The Committees came to consensus whether to accept, reject or modify the new text for incorporation into the 2014 *New York*

*City Construction Codes*. Technical committees were asked to reach agreement on as many of the proposed changes as possible. Consensus was reached on all modifications with the exception of ten issues. The Department mediated a resolution on five of those issues, and the Commissioner made the final determination on the remaining ones. This effort culminated in the passage of Local Laws 41 of 2012 and 141 of 2013.

## Structure and Applicability of the New Codes

Title 28 of the *New York City Administrative Code* contains five general administrative chapters that will govern all of the 2014 *New York City Construction Codes*, covering administration, enforcement, maintenance obligations, licensing, and miscellaneous provisions, including outdoor signs. These provisions were written by and for New York City and thus are not based on any I-Code. Following these five chapters are four additional chapters containing the Plumbing, Building, Mechanical, and Fuel Gas Codes. Each of the individual codes, in turn, contains a Chapter 1 with additional administrative provisions applicable to the specific matters covered by the particular code. The Plumbing, Building, Mechanical and Fuel Gas Codes reflect modifications to the I-Codes.

Alterations of existing buildings, at the option of the owner, are permitted to comply with the 1968 Building Code, with significant exceptions that the Department determined are sufficiently important to public safety to be implemented immediately regardless of the choice of underlying code.

Provisions of Title 28 that apply to all codes should be cited as “28-section number.” The technical codes may be cited separately; provisions of each should be cited as “PC section number,” “BC section number,” “MC section number,” and “FGC section number.” Section 28-101.3 governs the interpretation of the various codes, sections, and subsections of the law by providing:

**§28-101.3 Codes.** Any reference in this title to “this code” or “the code” shall be deemed to be a reference to this title and all of the codes comprising the *New York City Construction Codes* unless the context or subject matter requires otherwise. Whenever a section or subsection of this code is cited or referred to, subordinate consecutively numbered sections and subsections of the cited provision are deemed to be included in such reference unless the context or subject matter requires otherwise.

While the Department expects to promulgate new rules necessary to implement the 2014 revisions to the codes, Section 28-103.2. provides that existing rules will remain in effect:

**§28-103.20 Rules.** Rules promulgated by the department in accordance with the law in effect prior to July 1, 2008 shall remain in effect for the matters covered to the extent that such rules are not inconsistent with this code unless and until such rules are amended or repealed by the department.

## Existing Buildings

While the ICC family of codes includes an *International Existing Building Code*® (IEBC®) the Department determined to continue to allow compliance with the 1968 code as we transition from the 1968 code to a new set of standards for all buildings. Once the 2014 revisions to the codes are in place, the Department will turn to the development of an existing building code for the city. In the interim, at the owner’s option, existing buildings may be governed by either the new codes or the technical requirements of the 1968 Building Code. The latter option is subject to several important exceptions pursuant to Sections 28-101.4.3 and 28-101.4.5. Some exceptions direct users to special provisions for prior code buildings located in Sections BC 901, BC 1101, BC 1601 and BC 3001 of the *New York City Building Code* and Sections FGC 102.4 of the *New York City Fuel Gas Code*, MC 102.4 of the *New York City Mechanical Code* and PC 102.4 of the *New York City Plumbing Code*.

The City has not enacted a new residential code. The ICC’s *International Residential Code*® (IRC®) covers one- and two-family dwellings three stories or less, whereas its building code covers all other new buildings. After reviewing the work product of the technical committees that developed the text, the Department concluded that the City could effectively address one- and two-family dwellings in the body of the 2014 *New York City Building Code* itself. Accordingly, the 2014 *New York City Building Code* covers new construction of all building types.



## Codes Maintenance

At the national level, the I-Codes are kept current through the review of proposed changes submitted to the ICC by code enforcement officials, industry representatives, design professionals and other interested parties. Proposed changes are considered through an open code development process in which all interested and affected parties may participate.

The Department is mandated by the *Administrative Code* to review the latest edition of the I-Codes and to suggest modifications for use within New York City. This cycle will help ensure that New York City maintains an updated set of construction codes far into the future. This revision cycle is anticipated to occur every 3 years.

## Marginal and Other Markings

Solid vertical lines in the margins within the body of the codes indicate a substantive change from the 2008 version of the *New York City Construction Codes*.

Solid deletion arrows (➡) are provided in the margin to indicate a deleted paragraph or item from the 2008 version of the *New York City Construction Codes*.

An “NYC” in the margins within the body of the codes indicates a substantive change from the 2009 version of the I-Codes.

Hollow deletion arrows (⇨) are provided in the margin to indicate a deleted paragraph or item from the 2009 version of the I-Codes.

There are no marginal markings in Chapters 18, 23, 35, and Appendix K due to their substantial revisions.

A double dagger (‡) within the body of the codes indicates text that is corrected from the enacted legislation for purposes of clarity. Substantive corrections will appear in future code revisions.





# ACKNOWLEDGEMENTS

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**Deputy Mayor Anthony Shorris**

**Mayor Michael R. Bloomberg**  
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## COVER DESIGN

Rachel Richards

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# TITLE 28 OF THE NEW YORK CITY ADMINISTRATIVE CODE INCLUDING THE NEW YORK CITY CONSTRUCTION CODES

28-100	Administration
28-200	Enforcement
28-300	Maintenance of Buildings
28-400	Licensing and Registration of Businesses, Trades and Occupations Engaged in Building Work
28-500	Miscellaneous Provisions
28-600	NYC Plumbing Code
28-700	<b>NYC Building Code (included in this volume)</b>
28-800	NYC Mechanical Code
28-900	NYC Fuel Gas Code
28-1000	NYC Energy Conservation Code





# TITLE 28

## NEW YORK CITY CONSTRUCTION CODES

### CHAPTER 7

#### THE NEW YORK CITY BUILDING CODE

#### ARTICLE 701

#### ENACTMENT AND UPDATE OF THE NEW YORK CITY BUILDING CODE

**§28-701.1 Update.** No later than the third year after the effective date of the section 701.1 and every third year thereafter, the commissioner shall submit to the city council proposed amendments that he or she determines should be made to this code to bring it up to date with the latest edition of the International Building Code or otherwise modify the provisions thereof. In addition, prior to the submission of such proposal to the city council, such proposal shall be submitted to an advisory committee established by the commissioner pursuant to this title for review and comment.

**§28-701.2 Enactment of the New York city building code.** The New York city building code based on the 2003 edition of the International Building Code published by the International Code Council, with changes that reflect the unique character of the city and amendments that bring it up to date with the 2009 edition of such International Building Code, is hereby adopted to read as follows:

#### EFFECTIVE DATE

In accordance with Section 14 of Local Law 141 of 2013, this code shall take effect on October 1, 2014 except:

- (i) that this code shall not apply to construction work related to applications for construction document approval filed prior to such effective date; and
- (ii) sections 28-304.6.4, 28-304.6.5 and 28-304.6.6 of the Administrative Code of the City of New York are effective as of December 30, 2013; and
- (iii) section 403.5.2 of the New York City Building Code shall take effect the later of June 30, 2015 or the date of an amendment of the definition of floor area in the New York City Zoning Resolution providing for the exclusion of the floor area of the additional exit stairway and additional exit stairway width from the calculation of floor area for purposes of the New York City Zoning Resolution.



# TABLE OF CONTENTS

## CHAPTER 1 ADMINISTRATION..... 1

### Section

BC 101	General .....	1
BC 102	Applicability .....	1
BC 103	Department of Buildings .....	2
BC 104	Duties and Powers of the Commissioner of Buildings .....	2
BC 105	Permits .....	2
BC 106	Reserved .....	3
BC 107	Construction Documents .....	3
BC 108	Temporary Structures and Uses .....	7
BC 109	Fees .....	7
BC 110	Inspections .....	7
BC 111	Certificate of Occupancy .....	8
BC 112	Service Utilities .....	8
BC 113	Reserved .....	8
BC 114	Violations .....	8
BC 115	Stop Work Order .....	9
BC 116	Unsafe Structures and Equipment .....	9

## CHAPTER 2 DEFINITIONS..... 11

### Section

BC 201	General .....	11
BC 202	Definitions .....	11

## CHAPTER 3 USE AND OCCUPANCY CLASSIFICATION..... 27

### Section

BC 301	General .....	27
BC 302	Classification .....	27
BC 303	Assembly Group A .....	27
BC 304	Business Group B .....	28
BC 305	Educational Group E .....	28
BC 306	Factory Group F .....	29
BC 307	High-Hazard Group H .....	30
BC 308	Institutional Group I .....	38
BC 309	Mercantile Group M .....	39
BC 310	Residential Group R .....	40
BC 311	Storage Group S .....	42
BC 312	Utility and Miscellaneous Group U .....	43

## CHAPTER 4 SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY..... 45

### Section

BC 401	Scope .....	45
BC 402	Covered Mall and Open Mall Buildings .....	45
BC 403	High-rise Buildings .....	49
BC 404	Atriums .....	52
BC 405	Underground Buildings and Spaces .....	52
BC 406	Motor-vehicle-related Occupancies .....	54
BC 407	Group I-2 .....	59
BC 408	Group I-3 .....	61
BC 409	Motion Picture Projection Rooms .....	63
BC 410	Stages and Platforms .....	64
BC 411	Special Amusement Buildings .....	66
BC 412	Aircraft-related Occupancies .....	67
BC 413	Combustible Storage .....	70
BC 414	Hazardous Materials .....	70
BC 415	Groups H-1, H-2, H-3, H-4 and H-5 .....	75
BC 416	Application of Flammable Finishes .....	86
BC 417	Drying Rooms .....	86
BC 418	Organic Coatings .....	86
BC 419	Reserved .....	87
BC 420	Groups I-1, R-1, R-2, R-3 .....	87
BC421	Reserved .....	87
BC 422	Ambulatory Health Care Facilities .....	87
BC423	Storm Shelters .....	87
BC 424	Nonproduction Chemical Laboratories .....	87
BC 425	Uses and Occupancies Involving Radioactive Materials and Radiation-producing Equipment .....	90

## CHAPTER 5 GENERAL BUILDING HEIGHTS AND AREAS; SEPARATION OF OCCUPANCIES..... 93

### Section

BC 501	General .....	93
BC 502	Definitions .....	93
BC 503	General Building Height and Area Limitations .....	94
BC 504	Building Height Modifications .....	95

## TABLE OF CONTENTS

BC 505	Mezzanines and Equipment Platforms . . . . .	96
BC 506	Building Area Modifications . . . . .	97
BC 507	Unlimited Area Buildings. . . . .	98
BC 508	Mixed Use and Occupancy. . . . .	100
BC 509	Incidental Uses . . . . .	102
BC 510	Special Provisions. . . . .	103

### CHAPTER 6 TYPES OF CONSTRUCTION . . . . 107

#### Section

BC 601	General . . . . .	107
BC 602	Construction Classification. . . . .	107
BC 603	Combustible Material in Type I and II Construction . . . . .	110

### CHAPTER 7 FIRE AND SMOKE PROTECTION FEATURES . . . . . 113

#### Section

BC 701	General . . . . .	113
BC 702	Definitions . . . . .	113
BC 703	Fire-resistance Ratings and Fire Tests . . . . .	114
BC 704	Fire-resistance Rating of Structural Members. . . . .	115
BC 705	Exterior Walls. . . . .	117
BC 706	Fire Walls . . . . .	121
BC 707	Fire Barriers . . . . .	123
BC 708	Shaft Enclosures . . . . .	124
BC 709	Fire Partitions . . . . .	129
BC 710	Smoke Barriers . . . . .	129
BC 711	Smoke Partitions. . . . .	130
BC 712	Horizontal Assemblies . . . . .	130
BC 713	Penetrations. . . . .	131
BC 714	Fire-resistant Joint Systems . . . . .	134
BC 715	Opening Protectives . . . . .	135
BC 716	Ducts and Air Transfer Openings. . . . .	138
BC 717	Concealed Spaces . . . . .	143
BC 718	Fire-resistance Requirements for Plaster . . . . .	146
BC 719	Thermal- and Sound-insulating Materials . . . . .	146
BC 720	Prescriptive Fire Resistance . . . . .	147
BC 721	Calculated Fire Resistance . . . . .	164

### CHAPTER 8 INTERIOR FINISHES . . . . . 193

#### Section

BC 801	General . . . . .	193
BC 802	Definitions . . . . .	193
BC 803	Wall and Ceiling Finishes. . . . .	193

BC 804	Interior Floor Finish . . . . .	195
BC 805	Combustible Flooring Materials in Type I and II Construction . . . . .	197
BC 806	Decorations Materials and Trim. . . . .	197
BC 807	Insulation . . . . .	197
BC 808	Acoustical Ceiling Systems . . . . .	197

### CHAPTER 9 FIRE PROTECTION SYSTEMS . . 199

#### Section

BC 901	General . . . . .	199
BC 902	Definitions . . . . .	201
BC 903	Automatic Sprinkler Systems. . . . .	204
BC 904	Alternative Automatic Fire-extinguishing Systems . . . . .	211
BC 905	Standpipe Systems . . . . .	213
BC 906	Portable Fire Extinguishers . . . . .	217
BC 907	Fire Alarm and Detection Systems. . . . .	217
BC 908	Emergency Alarm Systems . . . . .	227
BC 909	Smoke Control Systems . . . . .	229
BC 910	Smoke and Heat Vents . . . . .	237
BC 911	Fire Command Center . . . . .	239
BC 912	Fire Department Connections. . . . .	239
BC 913	Fire Pumps . . . . .	240
BC 914	Emergency Responder Safety Features . . . . .	240
BC 915	Reserved. . . . .	241
BC 916	Postfire Smoke Purge Systems. . . . .	241
BC 917	Fire Department In-Building Auxiliary Radio Communication System (ARCS) . . . . .	242

### CHAPTER 10 MEANS OF EGRESS. . . . . 243

#### Section

BC 1001	Administration . . . . .	243
BC 1002	Definitions . . . . .	243
BC 1003	General Means of Egress . . . . .	245
BC 1004	Occupant Load . . . . .	246
BC 1005	Egress Width . . . . .	247
BC 1006	Means of Egress Illumination . . . . .	248
BC 1007	Accessible Means of Egress. . . . .	249
BC 1008	Doors, Gates and Turnstiles . . . . .	251
BC 1009	Stairways . . . . .	259
BC 1010	Ramps. . . . .	263
BC 1011	Exit Signs . . . . .	264
BC 1012	Handrails . . . . .	265
BC 1013	Guards . . . . .	266
BC 1014	Exit Access. . . . .	267

BC 1015	Exit and Exit Access Doorways . . . . .	269
BC 1016	Exit Access Travel Distance . . . . .	270
BC 1017	Aisles . . . . .	271
BC 1018	Corridors . . . . .	272
BC 1019	Egress Balconies . . . . .	273
BC 1020	Exits . . . . .	274
BC 1021	Number of Exits and Continuity . . . . .	274
BC 1022	Exit Enclosures . . . . .	275
BC 1023	Exit Passageways . . . . .	277
BC 1024	Luminous Egress Path Markings . . . . .	278
BC 1025	Horizontal Exits . . . . .	281
BC 1026	Exterior Exit Ramps and Stairways . . . . .	281
BC 1027	Exit Discharge . . . . .	283
BC 1028	Assembly . . . . .	284
BC 1029	Emergency Escape and Rescue . . . . .	290
BC 1030	Signage . . . . .	291

## **CHAPTER 11 ACCESSIBILITY . . . . . 293**

### **Section**

BC 1101	General . . . . .	293
BC 1102	Definitions . . . . .	294
BC 1103	Scoping Requirements . . . . .	295
BC 1104	Accessible Route . . . . .	295
BC 1105	Accessible Entrances . . . . .	297
BC 1106	Parking and Passenger Loading Facilities . . . . .	297
BC 1107	Dwelling Units and Sleeping Units . . . . .	299
BC 1108	Special Occupancies . . . . .	304
BC 1109	Other Features and Facilities . . . . .	307
BC 1110	Signage . . . . .	311

## **CHAPTER 12 INTERIOR ENVIRONMENT . . . . . 313**

### **Section**

BC 1201	General . . . . .	313
BC 1202	Definitions . . . . .	313
BC 1203	Ventilation . . . . .	313
BC 1204	Temperature and Humidity Control . . . . .	317
BC 1205	Lighting . . . . .	318
BC 1206	Yards and Courts . . . . .	319
BC 1207	Sound Transmission . . . . .	320
BC 1208	Interior Space Dimensions . . . . .	321
BC 1209	Access to Unoccupied Spaces . . . . .	322
BC 1210	Surrounding Materials . . . . .	322
BC 1211	Kitchens and Kitchenettes . . . . .	322
BC 1212	Rodent-proofing . . . . .	323
BC 1213	Refuse and Recyclable Storage . . . . .	323

## **CHAPTER 13 ENERGY EFFICIENCY . . . . . 325**

### **Section**

BC 1301	General . . . . .	325
---------	-------------------	-----

## **CHAPTER 14 EXTERIOR WALLS . . . . . 327**

### **Section**

BC 1401	General . . . . .	327
BC 1402	Definitions . . . . .	327
BC 1403	Performance Requirements . . . . .	327
BC 1404	Materials . . . . .	328
BC 1405	Installation of Wall Coverings . . . . .	329
BC 1406	Combustible Materials on the Exterior Side of Exterior Walls . . . . .	333
BC 1407	Metal Composite Materials (MCM) . . . . .	334
BC 1408	Exterior Insulation and Finish Systems (EIFS) . . . . .	335

## **CHAPTER 15 ROOF ASSEMBLIES AND ROOFTOP STRUCTURES . . . . . 337**

### **Section**

BC 1501	General . . . . .	337
BC 1502	Definitions . . . . .	337
BC 1503	Weather Protection . . . . .	337
BC 1504	Performance Requirements . . . . .	338
BC 1505	Fire Classification . . . . .	339
BC 1506	Materials . . . . .	340
BC 1507	Requirements for Roof Coverings . . . . .	340
BC 1508	Roof Insulation . . . . .	349
BC 1509	Rooftop Structures . . . . .	350
BC 1510	Reroofing . . . . .	351
BC 1511	Solar Photovoltaic Panels/Modules . . . . .	352

## **CHAPTER 16 STRUCTURAL DESIGN . . . . . 353**

### **Section**

BC 1601	General . . . . .	353
BC 1602	Definitions and Notations . . . . .	353
BC 1603	Construction Documents . . . . .	355
BC 1604	General Design Requirements . . . . .	356
BC 1605	Load Combinations . . . . .	358
BC 1606	Dead Loads . . . . .	360
BC 1607	Live Loads . . . . .	360
BC 1608	Snow Loads . . . . .	368
BC 1609	Wind Loads . . . . .	369
BC 1610	Soil Lateral Load . . . . .	384
BC 1611	Rain Loads . . . . .	385



## TABLE OF CONTENTS

BC 1612	Flood Loads . . . . .	385
BC 1613	Earthquake Loads . . . . .	385
BC 1614	Structural Integrity Definitions . . . . .	393
BC 1615	Structural Integrity—Prescriptive Requirements . . . . .	393
BC 1616	Structural Integrity—Key Element Analysis . . . . .	394
BC 1617	Structural Peer Review . . . . .	395
BC 1618	Loads on Temporary Installations . . . . .	396

## CHAPTER 17 STRUCTURAL TESTS AND SPECIAL INSPECTIONS . . . . . 399

### Section

BC 1701	General . . . . .	399
BC 1702	Definitions . . . . .	399
BC 1703	Approvals . . . . .	399
BC 1704	Special Inspections . . . . .	400
BC 1705	Reserved . . . . .	417
BC 1706	Reserved . . . . .	417
BC 1707	Special Inspections for Seismic Resistance . . . . .	417
BC 1708	Reserved . . . . .	418
BC 1709	Reserved . . . . .	418
BC 1710	Reserved . . . . .	418
BC 1711	Design Strengths of Materials . . . . .	418
BC 1712	Alternative Test Procedure . . . . .	418
BC 1713	Test Safe Load . . . . .	418
BC 1714	In-Situ Load Tests . . . . .	418
BC 1715	Preconstruction Load Tests . . . . .	419
BC 1716	Material and Test Standards . . . . .	420

## CHAPTER 18 SOILS AND FOUNDATIONS . . . . . 421

### Section

BC 1801	General and Definitions . . . . .	421
BC 1802	Geotechnical Investigations and Material Classifications . . . . .	422
BC 1803	Excavation, Grading and Fill . . . . .	426
BC 1804	Allowable Load-bearing Values of Soils . . . . .	427
BC 1805	Shallow and Rock Foundations . . . . .	429
BC 1806	Retaining Walls and other Retaining Structures . . . . .	432
BC 1807	Dampproofing and Waterproofing . . . . .	432
BC 1808	Deep Foundations . . . . .	433
BC 1809	Driven Piles . . . . .	441
BC 1810	Cast-in-place Concrete Pile . . . . .	445
BC 1811	Composite Piles . . . . .	450

BC 1812	Helical Piles . . . . .	450
BC 1813	Liquefaction Analysis . . . . .	452
BC 1814	Underpinning and Support of Adjacent Property . . . . .	453

## CHAPTER 19 CONCRETE . . . . . 455

### Section

BC 1901	General . . . . .	455
BC 1902	Definitions . . . . .	455
BC 1903	Specifications for Tests and Materials . . . . .	455
BC 1904	Durability Requirements . . . . .	456
BC 1905	Concrete Quality, Mixing and Placing . . . . .	457
BC 1906	Formwork, Embedded Pipes and Construction Joints . . . . .	462
BC 1907	Details of Reinforcement . . . . .	462
BC 1908	Modifications to ACI 318 . . . . .	464
BC 1909	Structural Plain Concrete . . . . .	467
BC 1910	Minimum Slab Provisions . . . . .	468
BC 1911	Anchorage to Concrete—Allowable Stress Design . . . . .	468
BC 1912	Anchorage to Concrete—Strength Design . . . . .	468
BC 1913	Shotcrete . . . . .	469
BC 1914	Reinforced Gypsum Concrete . . . . .	471
BC 1915	Concrete-filled Steel Columns . . . . .	471
BC 1916	Structural Integrity Requirements . . . . .	471
BC 1917	Paving . . . . .	472

## CHAPTER 20 ALUMINUM . . . . . 473

### Section

BC 2001	General . . . . .	473
BC 2002	Materials . . . . .	473
BC 2003	Additional Requirements . . . . .	473

## CHAPTER 21 MASONRY . . . . . 475

### Section

BC 2101	General . . . . .	475
BC 2102	Definitions and Notations . . . . .	475
BC 2103	Masonry Construction Materials . . . . .	478
BC 2104	Construction . . . . .	480
BC 2105	Quality Assurance . . . . .	481
BC 2106	Seismic Design . . . . .	482
BC 2107	Allowable Stress Design . . . . .	482
BC 2108	Strength Design of Masonry . . . . .	483
BC 2109	Empirical Design of Masonry . . . . .	483
BC 2110	Glass Unit Masonry . . . . .	484

BC 2111	Masonry Fireplaces. . . . .	484
BC 2112	Masonry Heaters. . . . .	489
BC 2113	Masonry Chimneys. . . . .	489
BC 2114	Structural Integrity Requirements. . . . .	496

## **CHAPTER 22 STEEL . . . . . 499**

### Section

BC 2201	General . . . . .	499
BC 2202	Definitions . . . . .	499
BC 2203	Identification and Protection of Steel for Structural Purposes . . . . .	499
BC 2204	Connections . . . . .	499
BC 2205	Structural Steel . . . . .	499
BC 2206	Steel Joists . . . . .	500
BC 2207	Steel Cable Structures. . . . .	501
BC 2208	Steel Storage Racks . . . . .	501
BC 2209	Cold-formed Steel. . . . .	501
BC 2210	Cold-formed Steel Light- frame Construction . . . . .	501
BC 2211	Minimum Thickness of Metal . . . . .	502
BC 2212	Structural Integrity Requirements. . . . .	502

## **CHAPTER 23 WOOD . . . . . 505**

### Section

BC 2301	General . . . . .	505
BC 2302	Definitions . . . . .	505
BC 2303	Minimum Standards and Quality . . . . .	506
BC 2304	General Construction Requirements. . . . .	510
BC 2305	General Design Requirements for Lateral-force-resisting Systems . . . . .	520
BC 2306	Allowable Stress Design. . . . .	521
BC 2307	Load and Resistance Factor Design . . . . .	528
BC 2308	Conventional Light-frame Construction. . . . .	528

## **CHAPTER 24 GLASS AND GLAZING. . . . . 573**

### Section

BC 2401	General . . . . .	573
BC 2402	Definitions . . . . .	573
BC 2403	General Requirements for Glass. . . . .	573
BC 2404	Wind, Snow, Seismic and Dead Loads on Glass . . . . .	573
BC 2405	Sloped Glazing and Skylights. . . . .	575
BC 2406	Safety Glazing . . . . .	576
BC 2407	Glass in Handrails and Guards . . . . .	578
BC 2408	Glazing in Athletic Facilities . . . . .	578

BC 2409	Glass in Elevator Hoistways and Elevator Cars . . . . .	579
BC 2410	Marking of Transparent Doors and Fixed Adjacent Transparent Sidelines. . . . .	579

## **CHAPTER 25 GYPSUM BOARD AND PLASTER. . . . . 581**

### Section

BC 2501	General . . . . .	581
BC 2502	Definitions . . . . .	581
BC 2503	Reserved. . . . .	581
BC 2504	Vertical and Horizontal Assemblies. . . . .	581
BC 2505	Shear Wall Construction . . . . .	581
BC 2506	Gypsum Board Materials . . . . .	582
BC 2507	Lathing and Plastering . . . . .	582
BC 2508	Gypsum Construction. . . . .	583
BC 2509	Gypsum Board in Showers and Water Closets . . . . .	584
BC 2510	Lathing and Furring for Cement Plaster (Stucco). . . . .	584
BC 2511	Interior Plaster . . . . .	585
BC 2512	Exterior Plaster. . . . .	585
BC 2513	Exposed Aggregate Plaster. . . . .	586

## **CHAPTER 26 PLASTIC . . . . . 587**

### Section

BC 2601	General . . . . .	587
BC 2602	Definitions . . . . .	587
BC 2603	Foam Plastic Insulation . . . . .	587
BC 2604	Interior Finish and Trim. . . . .	591
BC 2605	Plastic Veneer. . . . .	591
BC 2606	Light-transmitting Plastics . . . . .	591
BC 2607	Light-transmitting Plastic Wall Panels. . . . .	592
BC 2608	Light-transmitting Plastic Glazing. . . . .	593
BC 2609	Light-transmitting Plastic Roof Panels . . . . .	594
BC 2610	Light-transmitting Plastic Skylight Glazing. . . . .	594
BC 2611	Light-transmitting Plastic Interior Signs . . . . .	595
BC 2612	Fiber Reinforced Polymer and Fiberglass Reinforced Polymer . . . . .	595
BC 2613	Reflective Plastic Core Insulation. . . . .	596

## **CHAPTER 27 ELECTRICAL . . . . . 597**

### Section

BC 2701	General . . . . .	597
BC 2702	Emergency and Standby Power Systems . . . . .	597

## TABLE OF CONTENTS

### CHAPTER 28 MECHANICAL SYSTEMS ..... 601

#### Section

BC 2801 General ..... 601

### CHAPTER 29 PLUMBING SYSTEMS ..... 603

#### Section

BC 2901 General ..... 603

### CHAPTER 30 ELEVATORS AND CONVEYING SYSTEMS..... 605

#### Section

BC 3001 General ..... 605

BC 3002 Hoistway Enclosures ..... 606

BC 3003 Elevator Emergency Operations..... 607

BC 3004 Hoistway Venting..... 608

BC 3005 Conveying Systems ..... 608

BC 3006 Machine Rooms ..... 609

BC 3007 Fire Service Access Elevator ..... 609

BC 3008 Occupant Evacuation Elevators ..... 610

BC 3009 Service Equipment Certificates ..... 612

BC 3010 Elevator, Amusement and  
Other Device Operators ..... 613

BC 3011 Elevator Being Serviced, Repaired,  
Inspected or Tested ..... 613

BC 3012 Accidents ..... 613

BC 3013 Existing Installations ..... 613

BC 3014 Inspection and Testing ..... 613

### CHAPTER 31 SPECIAL CONSTRUCTION ..... 615

#### Section

BC 3101 General ..... 615

BC 3102 Membrane Structures ..... 615

BC 3103 Temporary Structures ..... 617

BC 3104 Pedestrian Walkways and Tunnels..... 617

BC 3105 Awnings, Canopies and  
Sun Control Devices ..... 618

BC 3106 Marquees..... 619

BC 3107 Signs ..... 619

BC 3108 Radio, Television, and Telecommunications  
Towers and Antennas ..... 619

BC 3109 Swimming Pools, Swimming Pool  
Enclosures, and Safety Devices..... 619

BC 3110 Automatic Vehicular Gates..... 623

BC 3111 Sidewalks Cafes ..... 623

BC 3112 Fences..... 623

### CHAPTER 32 ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY ..... 625

#### Section

BC 3201 General ..... 625

BC 3202 Encroachments ..... 625

### CHAPTER 33 SAFEGUARDS DURING CONSTRUCTION OR DEMOLITION ..... 631

#### Section

BC 3301 General ..... 631

BC 3302 Definitions ..... 637

BC 3303 Safeguards and Maintenance of Site ..... 642

BC 3304 Soil and Foundation Wok..... 650

BC 3305 Material Placement and Installation..... 653

BC 3306 Demolition ..... 658

BC 3307 Protection of Pedestrians ..... 662

BC 3308 Protection of Unenclosed Perimeters..... 669

BC 3309 Protection of Adjoining Property..... 674

BC 3310 Requirements for the Construction or  
Demolition of Major Buildings ..... 677

BC 3311 Explosive Powered and Projectile Tools ... 682

BC 3312 Explosives and Blasting ..... 683

BC 3313 Flammable and Combustible Mixtures,  
Compressed Gases, and Other  
Hazardous Materials..... 683

BC 3314 Scaffolds..... 683

BC 3315 Structural Ramps, Runways and  
Platforms ..... 703

BC 3316 Hoisting Equipment ..... 704

BC 3317 Material Hoists and Bucket Hoists..... 707

BC 3318 Personnel Hoists..... 707

BC 3319 Cranes and Derricks ..... 707

BC 3320 Material Handling Equipment ..... 711

### CHAPTER 34 RESERVED..... 715

### CHAPTER 35 REFERENCED STANDARDS ..... 717

#### Section

BC 3501 General ..... 717

BC 3502 Standards ..... 717

### APPENDIX A RESERVED..... 735

### APPENDIX B RESERVED..... 737

<b>APPENDIX C RESERVED .....</b>	<b>739</b>	<b>APPENDIX H OUTDOOR SIGNS.....</b>	<b>817</b>
<b>APPENDIX D FIRE DISTRICTS.....</b>	<b>741</b>	Section	
Section		BC H101 General .....	817
BC D101 General .....	741	BC H102 Definitions .....	817
BC D102 Building Restrictions .....	741	BC H103 Location .....	817
BC D103 Changes to Buildings .....	741	BC H104 Identification .....	817
BC D104 Buildings Located Partially in the Fire District.....	741	BC H105 Design and Construction .....	817
BC D105 Exceptions to Restrictions in Fire District.....	741	BC H106 Electrical.....	818
BC D106 Fire District Maps for the Boroughs of Richmond and Queens .....	742	BC H107 Material Limitations.....	818
<b>APPENDIX E SUPPLEMENTARY ACCESSIBILITY REQUIREMENTS .....</b>	<b>785</b>	BC H108 Animated Devices .....	819
Section		BC H109 Ground Signs .....	819
BC E101 General .....	785	BC H110 Roof Signs .....	819
BC E102 Definitions .....	785	BC H111 Wall Signs .....	819
BC E103 Accessible Route .....	785	BC H112 Projecting Signs .....	820
BC E104 Special Occupancies .....	785	BC H113 Marquee Signs .....	820
BC E105 Other Features and Facilities .....	786	BC H114 Flexible Fabric Signs .....	821
BC E106 Telephones .....	786	BC H115 Portable Signs.....	822
BC E107 Signage .....	787	BC H116 Temporary Signs .....	822
BC E108 Reserved .....	788	BC H117 Referenced Standards.....	822
BC E109 Transportation Facilities and Stations .....	788	<b>APPENDIX I RESERVED.....</b>	<b>823</b>
BC E110 Reserved .....	788	<b>APPENDIX J RESERVED.....</b>	<b>825</b>
BC E111 Reserved .....	788	<b>APPENDIX K MODIFIED INDUSTRY STANDARDS FOR ELEVATORS AND CONVEYING SYSTEMS.....</b>	<b>827</b>
BC E112 Referenced Standards .....	789	Chapter K1 Modifications To ASME A17.1-2000, Safety Code For Elevators And Escalators.....	827
<b>APPENDIX F RODENTPROOFING.....</b>	<b>791</b>	Chapter K2 Modifications To ASME B20.1-2003 Safety Standard For Conveyors And Related Equipment .....	848
Section		Chapter K3 Modifications to ASME A17.3-2002, Safety Code for Existing Elevators and Escalators .....	849
BC F101 General .....	791	Chapter K4 Modifications To ASME A17.1S-2005 Safety Code For Machine-Room-Less ("MRL") Elevators.....	859
BC F102 Protection .....	791	<b>APPENDIX L RESERVED.....</b>	<b>865</b>
<b>APPENDIX G FLOOD-RESISTANT CONSTRUCTION.....</b>	<b>793</b>		
Chapter G1 General Provisions .....	793		
Chapter G2 Definitions .....	799		
Chapter G3 Construction Standards.....	802		
Chapter G4 Referenced Standards.....	810		
Chapter G5 Modifications to Referenced Standards .....	811		

## TABLE OF CONTENTS

### APPENDIX M SUPPLEMENTARY REQUIREMENTS FOR ONE- AND TWO-FAMILY DWELLINGS..... 867

#### Section

BC M101	General .....	867
BC M102	Definitions .....	867
BC M103	Fire Wall Separation.....	867

### APPENDIX N ASSISTIVE LISTENING SYSTEMS PERFORMANCE STANDARDS..... 871

#### Section

BC N101	General .....	871
BC N102	Induction Loop System.....	871
BC N103	Infra-red System .....	871
BC N104	FM System .....	872

### APPENDIX O RESERVED ..... 875

### APPENDIX P TYPE B+NYC UNIT TOILET AND BATHING ROOMS REQUIREMENTS ..... 877

#### Section

BC P101	General .....	877
BC P102	Toilet and Bathing Rooms .....	877
BC P103	Referenced Standards .....	879

### APPENDIX Q MODIFIED NATIONAL STANDARDS FOR AUTOMATIC SPRINKLER, STANDPIPE, FIRE PUMP AND FIRE ALARM SYSTEMS ..... 881

#### Section

BC Q101	Scope.....	881
BC Q102	Installation of Sprinkler Systems .....	881
BC Q103	Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes .....	887
BC Q104	Installation of Sprinkler Systems in Residential Occupancies Up to and Including Six Stories in Height.....	888
BC Q105	Installation of Standpipe and Hose Systems .....	889
BC Q106	Installation of Stationary Fire Pumps .....	897

### APPENDIX R ACOUSTICAL TILE AND LAY-IN PANEL CEILING SUSPENSION SYSTEMS ..... 899

#### Section

BC R101	General .....	899
BC R102	Modifications to ASTM C 635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings .....	899
BC R103	Modifications to ASTM C 636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.....	899

### APPENDIX S SUPPLEMENTARY FIGURES FOR LUMINOUS EGRESS PATH MARKINGS ..... 905

#### Section

BC S101	General .....	905
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### INDEX RESERVED..... 915



# CHAPTER 1

## ADMINISTRATION

NYC

### SECTION BC 101 GENERAL

**101.1 Title.** This code shall be known and may be cited as the “*New York City Building Code*,” “NYCBC” or “BC.” All section numbers in this code shall be deemed to be preceded by the designation “BC.”

**101.2 Scope.** The provisions of this code shall apply to the construction, alteration, movement, addition, replacement, repair, equipment, use and occupancy, location, maintenance, removal and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures.

**101.3 Intent.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

**101.4 Referenced codes.** The other codes listed in Sections 101.4.1 through 101.4.6 and referenced elsewhere in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference.

**101.4.1 Electrical.** The provisions of the *New York City Electrical Code* shall apply to the installation of electrical systems, including alterations, repairs, replacement, equipment, appliances, fixtures, fittings and appurtenances thereto.

**101.4.2 Gas.** The provisions of the *New York City Fuel Gas Code* shall apply to the installation of gas piping, gas appliances and related accessories as covered in this code. These requirements apply to gas piping systems extending to the inlet connections of appliances and the installation and operation of residential and commercial gas appliances and related accessories.

**101.4.3 Mechanical.** The provisions of the *New York City Mechanical Code* shall apply to the installation, alterations, repairs and replacement of mechanical systems, including equipment, appliances, fixtures, fittings and/or appurtenances, including ventilating, heating, cooling, air-conditioning and refrigeration systems, incinerators and other energy-related systems.

**101.4.4 Plumbing.** The provisions of the *New York City Plumbing Code* shall apply to the installation, alteration, repair and replacement of plumbing systems, including equipment, appliances, fixtures, fittings and appurtenances, and where connected to a water or sewage system and all aspects of a medical gas system.

**101.4.5 Fire prevention.** The provisions of the *New York City Fire Code* shall apply to:

1. The manufacturing, storage, handling, use, sale and transportation of hazardous materials, except for the installation of storage tanks and auxiliary storage tanks for oil-burning equipment;
2. The design, installation, operation and maintenance of devices, equipment and systems designed to prevent,

vent, mitigate, control and extinguish fire, explosions or other life safety hazards;

3. Emergency preparedness and planning, including the orderly evacuation of occupants of a building, structure or premises in the event of fire, explosion, biological, chemical or hazardous material incident or release, natural disaster or other emergency, or the threat thereof;
4. The prevention, mitigation and control of hazards to fire-fighters and emergency responders during emergency operations; and
5. The operation and maintenance of any manual, automatic or other fire alarm or fire-extinguishing device, equipment or system.

**101.4.6 Energy.** The provisions of the *New York City Energy Conservation Code* shall apply to all matters governing the design and construction and alteration of buildings for energy efficiency.

### SECTION BC 102 APPLICABILITY

**102.1 General.** Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

**102.2 Reserved.**

**102.3 Application of references.** References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

**102.4 Referenced standards.** The standards referenced in this code and in the rules of the department shall be considered part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and referenced standards, the provisions of this code shall apply. Refer to Article 103 of Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to referenced standards.

**102.4.1 Editions of referenced standards.** References to standards in this code shall be to the editions of those standards provided for in Chapter 35 of this code, or as otherwise provided by rule.

**102.5 Partial invalidity.** In the event that any part or provision of this code is held to be illegal or void, this shall not have the effect of making void or illegal any of the other parts or provisions.



**102.6 Existing structures.** The legal occupancy of any structure lawfully in existence at the time of the adoption or a subsequent amendment of this code shall be permitted to continue without change, except as is otherwise specifically provided in this code or as is deemed necessary by the commissioner for the general safety and welfare of the occupants and the public. Refer to Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to existing structures.

## SECTION BC 103 DEPARTMENT OF BUILDINGS

**103.1 General.** Refer to the New York City Charter and Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 104 DUTIES AND POWERS OF COMMISSIONER OF BUILDINGS

**104.1 General.** The commissioner shall have the authority to render interpretations of this code and to adopt rules, policies and procedures in order to clarify and implement its provisions. Such interpretations, policies, procedures, and rules shall be in compliance with the intent and purpose of this code. See the New York City Charter and Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to the authority of the Commissioner of Buildings.

## SECTION BC 105 PERMITS

**105.1 General.** Permits shall comply with this section, with Article 105 of Chapter 1 of Title 28 of the *Administrative Code*, and with requirements found elsewhere in this code.

**105.2 Required.** Any owner or authorized agent who intends to construct, add to, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, add to, alter, repair, remove, convert or replace any gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application for construction document approval in accordance with Chapter 1 of Title 28 of the *Administrative Code* and this chapter and obtain the required permit.

**105.3 Work exempt from permit.** Exemptions from permit requirements of this code as authorized in Chapter 1 of Title 28 of the *Administrative Code* and the rules of the department shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or rules.

**105.4 Validity of permit.** The issuance or granting of a permit shall not be construed to be a permit for, or an approval of, any violation of any of the provisions of this code or of any other law. Permits presuming to give authority to violate or cancel the provisions of this code or other law shall not be valid. The issuance of a permit based on construction documents and other data shall not prevent the commissioner from requiring the correction of errors in the construction

documents and other data. The commissioner is also authorized to prevent occupancy or use of a structure where in violation of this code or of any other law.

**105.5 Foundation and earthwork permits.** In addition to the requirements of Chapter 1 of Title 28 of the *Administrative Code* and Chapter 33 of this code, applications for foundation and earthwork permits shall include:

- 1. Notice to adjoining owners.** Proof of notice to adjoining owners as required by Section 3304.3.2.
- 2. Liens.** Satisfactory evidence that the property is free from any lien for unpaid city taxes, assessments, water rates, bail bonds, or judgments obtained by the city, together with consent in writing of the mortgagee, if there is a mortgage upon the property, and the consent in writing of the surrogate's court or supreme court, if the owner of the property is a minor or incompetent.

**105.5.1 Notice to the department of commencement of foundation and earthwork.** The foundation and earthwork permit shall be issued on the condition that the applicant will provide written notice to the department at least 24 but no more than 48 hours prior to the commencement of the foundation or earthwork as required by Section 3304.3.1.

**105.6 Full demolition permits.** In addition to the requirements of Chapter 1 of Title 28 of the *Administrative Code* and Chapter 33 of this code, applications for full demolition permits shall include:

- 1. Utility certifications.** Certifications by the respective utility companies or governmental agencies having jurisdiction that all gas, electric, water, steam and other service lines to the building have been disconnected as required by Section 3303.2.5.
- 2. Notice to adjoining owners.** Proof of notice to adjoining owners as required by Section 3306.3.2.
- 3. Certification of rodent extermination.** Certification in accordance with department rules that the building has been treated effectively for rodent extermination as required by Section 3306.9.13.

**105.6.1 Notice to department of commencement of demolition work.** The full demolition permit shall be issued on the condition that the applicant will provide written notice to the department at least 48 hours prior to the commencement of demolition work.

**105.7 Sign permits.** In addition to the requirements of Chapter 1 of Title 28 of the *Administrative Code*, permits for the erection, alteration or installation of signs shall be subject to the special provisions set forth in Sections 105.7.1 through 105.7.5.

**105.7.1 Identification number.** Every sign permit shall have an identification number.

**105.7.2 Changing copy or structural change of sign or sign structure.** The changing of copy on a sign not permitted for changeable copy or any structural change of the sign or sign structure shall require a new permit pursuant to this code.

**105.7.3 Permit does not constitute authorization for illegal sign.** The issuance of a permit for the erection, alteration or installation of a sign or sign structure issued pursuant to this code shall not be deemed to constitute permission or authorization to maintain a sign that would otherwise be illegal without a maintenance permit for an outdoor sign if required pursuant to this code and department rule or that is otherwise illegal pursuant to any other provision of law nor shall any permit issued hereunder constitute a defense in an action or proceeding with respect to such an unlawful sign.

**105.7.4 Name and business address of licensed sign hanger.** The application shall contain the name and business address of the licensed sign hanger who is to perform or supervise the proposed work.

**105.7.5 Outdoor advertising company.** If the sign or sign location is under the control of an outdoor advertising company, as defined in Chapter 5 of Title 28 of the *Administrative Code*, the application shall be accompanied by the name and, where provided by rule, the registration number of such outdoor advertising company.

**105.8 Temporary construction equipment permits.** In addition to the requirements of Chapter 1 of Title 28 of the *Administrative Code*, permits for the erection, installation and use of temporary construction equipment shall be subject to the special provisions set forth in Sections 105.8.1 through 105.8.3.

**105.8.1 Application.** The need for each specific item of construction equipment shall be stated on the application.

**105.8.2 Term of permit.** Notwithstanding any other provision of this code, a construction equipment permit shall expire 1 year from the date of issuance, or when the permit holder's insurance or street obstruction bond expires, whichever is earlier. Such permit shall be renewable. Such permit must be in effect at all times during which the equipment is at the work site.

**105.8.3 Special provisions for renewal of permit for a sidewalk shed.** An application for the renewal of a construction equipment permit for a sidewalk shed used in connection with the alteration of a building shall be accompanied by a report, acceptable to the department, prepared by a registered design professional who has examined that part of the premises on which the work requiring the use of a sidewalk shed is being performed. Such report shall document the condition of the applicable part of the premises and the scope of work that has been performed thereon since the issuance of the permit and shall provide an estimate of the additional time needed to complete the work.

**105.9 Mandatory sewer and catch basin work required by Section 24-526 of the *Administrative Code*.** In addition to the requirements of Chapter 1 of Title 28, an applicant for a permit who is required pursuant to Section 24-526 of the *Administrative Code* to construct or repair defects in sewers or catch basins that lie outside the property shall submit certification from the Department of Environmental Protection that the applicant or owner has provided the Department of Environmental Protection with:

1. A performance bond or other security satisfactory to the Department of Environmental Protection and approved as to form by the Law Department for the full cost, as estimated by the Department of Environmental Protection, of constructing the part of the storm water drainage system for such property which shall lay outside the property line and repairing defects in such construction, if and as required by Section 24-526 of the *Administrative Code*;
2. Any license or other written instrument that the Department of Environmental Protection or the Law Department may reasonably request that gives the Department of Environmental Protection, its agents and contractors and the surety for a performance bond described in Item 1 above the legal right to enter private property to perform the work described in Item 1 above, pursuant to the terms of the performance bond or in accordance with the conditions of acceptance of other security described in Item 1 above, and the legal right to connect to, to extend or to discharge storm water into any private sewer authorized as a point of disposal pursuant to Section 24-526 of the *Administrative Code*, in the event that the owner of property fails to do so, if and as required pursuant to Section 24-526 of the *Administrative Code*;
3. Insurance of a kind and in an amount that the Department of Environmental Protection and the Law Department deem satisfactory to insure the city fully for all risks of loss, damage to property or injury to or death of persons to whomever occurring, arising out of or in connection with the performance of all work described in this section.

## SECTION BC 106 RESERVED

## SECTION BC 107 CONSTRUCTION DOCUMENTS

**107.1 General.** Construction documents shall comply with Chapter 1 of Title 28 of the *Administrative Code*, this section and other applicable provisions of this code and its referenced standards.

**107.2 Required construction documents.** In addition to the requirements of Chapter 1 of Title 28 of the *Administrative Code*, the applicant shall submit any and all of the documents specified in Sections 107.3 through 107.15 as appropriate to the nature and extent of the work proposed.

**107.2.1 Composite plans.** Composite plans showing architectural, structural, and mechanical parts and related energy use systems of a building may be submitted provided that a clear understanding of each part and system is not impaired.

**107.2.2 Multiple building developments.** The same set of plans may be used for several buildings of the same construction, if such buildings are located on adjoining lots under the same ownership, and if applications for

construction document approval for the lots are filed simultaneously.

**107.3 Lot diagram.** The lot diagram shall show compliance with the *New York City Zoning Resolution*, indicating the size, height, and location of the proposed construction including parking and curb cuts; all existing structures on the zoning lot and their distances from lot and street lines; the established grade and existing curb elevations; and the proposed final grade elevations of the site shown by contours or spot grades at reasonable intervals. The lot diagram shall be drawn in accordance with an accurate boundary survey to the city datum, made by a land surveyor, which shall be attached to and form part of the application. A complete zoning analysis shall accompany the lot diagram with citation to the relevant sections of the *New York City Zoning Resolution*.

**107.4 Building classification statement.** The statement shall identify:

1. The occupancy group or groups that apply to parts of the building in accordance with Section 302;
2. The occupancy group of the main use or dominant occupancy of the building;
3. The construction class of the building in accordance with Section 602;
4. The structural occupancy/risk category in accordance with Table 1604.5;
5. The height of the building as defined in Section 502.1;
6. The applicable measurements to the highest and lowest level of Fire Department access;
7. Whether the building is inside or outside of the fire districts; and
8. For multiple dwellings, the multiple dwelling classification as established by the *New York State Multiple Dwelling Law*.

**107.5 Means of egress plans.** Floor and roof plans shall show compliance with the requirements of Chapter 10, with sufficient notations indicating egress features and complete egress analysis as required by this code.

**107.6 Architectural plans.** Construction documents for all buildings shall provide detailed drawings of all architectural elements of the building showing compliance with the code, including but not limited to doors, windows and interior finish schedules, details necessary to substantiate all required fire protection characteristics, details demonstrating compliance with the *New York City Energy Conservation Code* and details demonstrating compliance with all accessibility requirements of this code. Site safety features shall be shown where applicable. Plans shall also provide details of the exterior wall envelope as required, including but not limited to flashing, insulation, vapor retarder, intersections with dissimilar materials, corners, end details, control joints, intersections at roof, eaves or parapets, means of drainage, water-resistive membrane and details around openings.

**Exception:** Where a curtain wall system is to be employed containing elements that are normally detailed on shop or working drawings, approval of construction documents shall be conditioned upon deferred submittal

of such shop or working drawings showing the approval of the registered design professional who prepared the architectural construction documents, or of a signed statement by such registered design professional that such drawings were prepared to his or her satisfaction. In such cases, submittal of construction documents showing compliance with the *New York City Energy Conservation Code* related to such curtain wall may also be deferred. Such deferred submittal of construction documents must demonstrate that the estimated annual energy use for the envelope in the energy analysis submitted as part of the initial filing is not exceeded.

**107.7 Structural plans.** Structural plans shall include the data and information described in this section and in Chapter 16. Structural calculations shall be made available to the department upon request.

#### Exceptions:

1. Where structural elements are normally detailed on shop or working drawings, approval of construction documents shall be conditioned upon deferred submittal of such shop or working drawings showing the approval of the registered design professional who prepared the structural construction documents, or of a signed statement by such registered design professional that such drawings were prepared to his or her satisfaction.
2. In cases where the detailing of structural elements has been made on the basis of fire-resistance ratings, load tables, or similar data as given in manufacturer's catalogues, approval of construction documents shall be conditional upon submission of a manufacturer's designation attesting to the accuracy of the data and indicating that such data were derived in conformance with the provisions of this code. Where the detailing of structural elements has been made on the basis of data published in technical documents of recognized authority issued or accredited by the agency or association promulgating the applicable referenced standard, such manufacturer's designation will not be required.

**107.7.1 Foundation plans.** Foundation plans shall show compliance with the requirements of Chapter 18 of this code regarding foundation design and shall show the plan locations, design loads, design elevations of the bottoms, and details as to sizes, reinforcements, and construction of all footings, piers, foundation walls, pile groups, and pile caps. The levels of footings of adjacent structures shall be indicated or, if the adjacent structures are pile supported, this shall be stated. Where applicable, the plans shall include underpinning details. In addition, there shall be a statement indicating the character and minimum class of the soil strata required for the support of the foundation; the allowable soil pressure used for the design of footings; and the character, class, and presumptive bearing capacity of the bearing stratum to which piling is required to penetrate. The types and design capacities of piling and the records of required borings or test pits shall also be shown. In addition, foundation plans



shall include insulation details as required by the *New York City Energy Conservation Code*.

**107.7.2 Floor plans.** Floor plans and sections showing all structural requirements shall be provided for all levels.

**107.7.3 Detailed drawings.** Drawings shall show sizes, sections, and locations of members, and such other information as may be required to indicate clearly all structural elements and special structural engineering features.

**107.7.4 Column schedules.** Column schedules shall show the design load contributed by the framing at any level and the total accumulated design load at each level.

**107.7.5 Truss forces.** Where trusses are employed, a diagram or table shall indicate the loads or moments in the various members under the design loading conditions. The requirement for a diagram or table may be waived when the trusses consist of elements selected from load tables or similar data, subject to the requirements for verification described in this code.

**107.7.6 Prestressing forces.** Where pre-stressed members are employed, a schedule or table shall show the total prestressing forces and the method and sequence of application.

**107.8 Earthwork plans.** Where the application is sought solely for or includes earthwork, excavation or fill operations, including but not limited to site decontamination, soil remediation and grading, the applicant shall submit 1) a lot diagram showing the exact location of the lot and dimensions to the nearest corner; and 2) plans showing the exact location, extent, and depth or height of the proposed earthwork, excavation or fill operation and any existing utilities, foundations or other infrastructure potentially impacted by the earthwork, excavation or fill operation. For excavation operations, the plans shall also indicate the levels of footings of all adjacent structures or, if the adjacent structures are pile supported, this shall be stated. Where applicable, the plans shall also include underpinning details, soil information in accordance with Chapter 18, and a final grading plan representing the lot after all earthwork, excavation or fill operations have been completed.

**107.9 Fire protection system plans.** Construction documents for fire protection systems shall include a plot plan to scale indicating the location of the system in relation to the rest of the building and shall comply with Sections 107.9.1 through 107.9.4. Such plans shall not be required in connection with applications for limited standpipe alterations and limited sprinkler alterations.

**107.9.1 Sprinkler systems.** Sprinkler systems plans shall comply with Section 903.1.2.

**107.9.2 Alternative automatic fire-extinguishing systems.** Alternative automatic fire-extinguishing systems plans shall comply with Section 904.1.1.

**107.9.3 Standpipe systems.** Standpipe systems plans shall comply with Section 905.1.1.

**107.9.4 Fire alarm and detection systems.** Fire alarm and detection systems plans shall comply with Section 907.1.1.

**107.10 Sign installation plans.** Construction documents for sign applications shall comply with Section H105.2 in Appendix H.

**107.11 Discharge of sewage and discharge and/or management of stormwater runoff.** Applications for construction document approval shall comply with Sections 107.11.1 and 107.11.2.

**107.11.1 Sewage.** Applications for construction document approval shall include submittal documents relating to the availability and feasibility of a public sanitary or public combined sewer and/or other approved discharge for sewage in accordance with Sections 107.11.1.1 and 107.11.1.2 for the following types of applications:

1. New buildings that include any fixtures that produce sewage;
2. Alterations that require an increase in size to an existing sanitary or combined sewer connection; and/or
3. Alterations requiring a new connection to a sanitary or combined sewer.

**107.11.1.1 Connection feasible and available.** Where a public sanitary or combined sewer is certified by the Department of Environmental Protection or certified by an applicant in accordance with rules of such department to be available and connection thereto feasible, the applicant shall submit:

1. **Department of Environmental Protection certification of availability and feasibility.** A sewer certification issued by the Department of Environmental Protection that a public sanitary or combined sewer is available and connection thereto is feasible. Applications for such certification shall be made to the Department of Environmental Protection on forms specified by such department (Department of Environmental Protection "house/site connection proposal application" or other form as specified in the rules of such department) and shall be reviewed and approved by such department in accordance with the rules of such department. Such certification may be conditioned by such department on part or all of the sewage to be disposed of with an on-site disposal system or with the use of an alternative disposal system; or
2. **Applicant certification of availability and feasibility.** A certification submitted by the applicant to the Department of Environmental Protection in accordance with the rules of such department that a public sanitary or combined sewer is available and connection thereto is feasible, in such cases where the availability and feasibility of connection to a public sanitary or combined sewer are allowed to be certified by the applicant pursuant to such rules. Such certification shall be on forms specified by such department (Department of Environmental Protection "house/site connection proposal application" or

other form as specified in the rules of such department).

#### 107.11.1.2 Connection not feasible or not available.

Where a public sanitary or combined sewer is not available, or where connection thereto is not feasible, the applicant shall submit:

1. **Department of Environmental Protection or applicant certification of unavailability or non-feasibility.** (i) A certification issued by the Department of Environmental Protection that a public sanitary or combined sewer is not available or that connection to an available sewer is not feasible. Such certification shall be on forms specified by such department (Department of Environmental Protection "house/site connection proposal application" or other form as specified in the rules of such department) or (ii) A certification submitted by the applicant to the Department of Environmental Protection that a public sanitary or combined sewer is not available or that connection thereto is not feasible, in such cases where the availability and feasibility of connection to a public sanitary or combined sewer are allowed to be certified by the applicant pursuant to the rules of such department. Such certification shall be on forms specified by such department (Department of Environmental Protection "house/site connection proposal application" or other form as specified in the rules of such department); and
2. **On-site disposal.** A proposal for the design and construction of a system for the on-site disposal of sewage conforming to the provisions of this code and other applicable laws and rules including but not limited to minimum required distances from lot lines or structures and subsoil conditions. Construction documents for such system shall be subject to the approval of the department.

**107.11.2 Stormwater.** Applications for construction document approval shall include submittal documents relating to the availability and feasibility of a public combined or storm sewer or other approved method for stormwater discharge in accordance with Sections 107.11.2.1 and 107.11.2.2 for the following types of applications:

1. New buildings;
2. Alterations of buildings proposing horizontal building enlargement; and/or
3. Alterations that increase impervious surfaces on the tax lot.

#### Exceptions:

1. Applications for construction document approval for the alteration of an existing one- or two-family dwelling need not include such submittal documents, where the area of a proposed horizontal building enlargement and any proposed increase

in impervious surfaces combined is less than or equal to 200 square feet (19 m<sup>2</sup>).

- 1.1. This exception shall not apply if the horizontal building enlargement and increase in impervious surface related to the current application for construction document approval and any other enlargement or increase in impervious surface made on the same tax lot after July 1, 2008 together exceed 200 square feet (19 m<sup>2</sup>).
2. Applications for construction document approval for the alteration of a building need not include such submittal documents, where the area of a proposed horizontal building enlargement and any proposed increase in impervious surfaces on a lot combined is less than or equal to 1,000 square feet (93 m<sup>2</sup>), and on-site disposal of stormwater conforming to the provisions of the applicable laws and rules as determined by the department is proposed for such enlargement and/or increase in impervious surface.
  - 2.1. This exception shall not apply where on-site disposal cannot be designed to conform to the provisions of the applicable laws and rules including but not limited to minimum required distances from lot lines or structures or subsoil conditions as determined by the department.
  - 2.2. This exception shall not apply if the horizontal building enlargement and increase in impervious surface related to the current application for construction document approval and all other enlargements or increases in impervious surface made on the same tax lot after July 1, 2008 together exceed 1,000 square feet (93 m<sup>2</sup>).

**107.11.2.1 Connection feasible and available.** Where a public combined or storm sewer is certified by the Department of Environmental Protection or certified by an applicant in accordance with rules of such department to be available and connection thereto is feasible, applicants shall submit:

1. **Department of Environmental Protection certification of availability and feasibility.** A sewer certification issued by the Department of Environmental Protection that a public storm or combined sewer is available and connection thereto is feasible. Applications for such certification shall be made to the Department of Environmental Protection on forms specified by such department (Department of Environmental Protection "house/site connection proposal application" or other form as specified in the rules of such department) and shall be reviewed and approved by such department in accordance with the rules of such department. Such certification may be conditioned by such department on part or all of the stormwater runoff to be disposed of

through an on-site detention or retention system, or by use of alternative disposal methods including but not limited to ditches, swales or watercourses; or

2. **Applicant certification of availability and feasibility.** A certification submitted by the applicant to the Department of Environmental Protection in accordance with the rules of such department that a public storm or combined sewer is available and connection thereto is feasible, in such cases where the availability and feasibility of connection to a public storm or combined sewer are allowed to be certified by the applicant pursuant to such rules. Such certification shall be on forms specified by such department (Department of Environmental Protection “house/site connection proposal application” or other form as specified in the rules of such department).

#### 107.11.2.2 Connection not feasible or not available.

Where a public combined or storm sewer is not available, or where connection thereto is not feasible, applicants shall submit:

1. **Department of Environmental Protection or applicant certification of unavailability or non-feasibility.** (i) Certification issued by the Department of Environmental Protection that a public storm or combined sewer is not available or that connection thereto is not feasible. Such certification shall be on forms specified by such department (Department of Environmental Protection “house/site connection proposal application” or other form as specified in the rules of such department); or (ii) Certification submitted by the applicant to the Department of Environmental Protection that a public storm or combined sewer is not available or that connection thereto is not feasible, in such cases where the availability and feasibility of connection to a public storm or combined sewer are allowed to be certified by the applicant pursuant to rules of such department. Certification shall be on forms specified by such department (Department of Environmental Protection “house/site connection proposal application” or other form as specified in the rules of such department); and
2. **On-site disposal.** A proposal for the design and construction of a system for the on-site disposal of stormwater conforming to the provisions of this code and other applicable laws and rules including but not limited to minimum required distances from lot lines or structures and subsoil conditions. Construction documents for such system shall be subject to the approval of the department.

**107.12 Predemolition photographs.** In addition to the requirements of Section 3306.3, construction documents for full demolition shall comply with the following requirements for archival photographs:

1. **Number required.** Applications shall contain two sets of photographs of the building or buildings to be demolished or removed. Both sets shall be received by the department on behalf of the New York City Landmarks Preservation Commission and the New York City Municipal Archives Division of the Department of Records and Information Services.

2. **Format.** The photographs shall conform to the standards and specifications established by rules promulgated by the commissioner upon the advice of the commissioner of the Department of Records and Information Services and the chairperson of the Landmarks Preservation Commission.

**Exception:** Applications made on behalf of the New York City Department of Housing Preservation and Development or made pursuant to Article 215 of Chapter 2 of Title 28 of the *Administrative Code* are exempt from the requirements of this section.

**107.13 Energy efficiency.** Construction documents shall include compliance documentation as required by the *New York City Energy Conservation Code*.

**107.14 Mechanical and fuel gas plans.** Construction documents for gas piping, heating, ventilation, refrigeration and other mechanical work to be performed shall be submitted as per *New York City Mechanical and Fuel Gas Codes*.

**107.15 Plumbing plans.** Construction documents for plumbing work to be performed shall be submitted as per the *New York City Plumbing Code*.

## SECTION BC 108 TEMPORARY STRUCTURES AND USES

**108.1 General.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 109 FEES

**109.1 Payment of fees.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 110 INSPECTIONS

**110.1 General.** Except as otherwise specified, inspections required by this code or by the department during the progress of work may be performed on behalf of the owner by approved agencies or, if applicable, by special inspectors. However, in the interest of public safety, the commissioner may direct that any of such inspections be performed by the department. All inspections shall be performed at the sole cost and expense of the owner. Refer to Article 116 of Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to inspections.

**110.2 Preliminary inspection.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.



**110.3 Required progress inspections.** The inspections set forth in Sections 110.3.1 through 110.3.8 shall be made during the progress of work to verify substantial compliance with the code and with approved construction documents.

**110.3.1 Footing and foundation inspection.** Footing and foundation inspections shall be made after excavations for footings are complete and any required reinforcing steel is in place. For concrete foundations, any required forms shall be in place prior to inspection. Materials for the foundation shall be on the job, except where concrete is ready mixed in accordance with ASTM C 94, the concrete need not be on the job.

**110.3.2 Lowest floor elevation.** In areas of special flood hazard, upon placement of the lowest floor, including the basement (for flood zone purposes), and prior to further vertical construction, the elevation inspection report required in Item 1 of Section G105.3 of Appendix G shall be submitted to the department.

**110.3.3 Structural wood frame inspection.** Inspections shall be performed for wood structural framing to determine compliance with the approved construction documents.

**Exception:** Prefabricated wood structural elements and assemblies subject to Section 1704.6.1 through 1704.6.3 shall not be subject to progress inspection.

**110.3.4 Fire-resistance-rated construction inspection.** Fire-resistance-rated construction shall be inspected to determine compliance with the approved construction documents, including inspection of the following work:

1. Fire-resistance-rated partitions, floors, ceilings, shafts; and
2. Fire shutters.

**Exception:** Where the scope of work affecting an existing fire-rated wall assembly is limited to through-penetration firestopping and, in the course of work, the cutting away or removal of any part of the existing fire-resistance-rated construction becomes necessary in the general area surrounding the penetration, not to exceed 4 square feet (0.37 m<sup>2</sup>) in any given area, the progress inspection for fire-resistance-rated construction shall not be required provided that the special inspection agency for the through-penetration firestopping special inspection verifies that the removed portion of fire-resistance-rated construction (i) is less than 4 square feet (0.37 m<sup>2</sup>), and (ii) has been restored to its original condition.

**110.3.5 Energy code compliance inspections.** Inspections shall be made to determine compliance with approved construction documents.

**110.3.6 Other inspections.** In addition to the inspections specified above, the commissioner is authorized to make or require other inspections of any construction work to ascertain compliance with the provisions of this code and other laws that are enforced by the department.

**110.4 Special inspections.** Special inspections required by this code or by the commissioner shall be performed by special inspection agencies.

**110.5 Final inspection.** Refer to Article 116 of Chapter 1 of Title 28 of the *Administrative Code*.

**110.6 Issuance of certificate of compliance.** Upon satisfactory inspection of service equipment and the satisfaction of all the requirements for sign-off, the department shall issue a certificate of compliance as applicable for the following service equipment:

1. Elevators;
2. Escalators;
3. Moving walkways;
4. Heating systems; and
5. Dumbwaiters.

**110.7 Approved inspection agencies.** Refer to Articles 114 and 115 of Chapter 1 of Title 28 of the *Administrative Code*.

**110.8 Inspection requests.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

**110.9 Satisfactory inspection report required.** Portions of work requiring inspection may be sequenced or phased to allow continuing progress of that work provided that work shall not be done beyond the point indicated in each successive required inspection for that phase. The inspector shall either indicate the portion of the construction that is satisfactory as completed, or notify the permit holder or the superintendent of construction wherein the same fails to comply with this code. Any portions that do not comply shall be corrected and such portion shall not be covered or concealed until corrected. The person performing the inspection shall complete a report of satisfactory inspection. Refer to Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 111 CERTIFICATE OF OCCUPANCY

**111.1 General.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 112 SERVICE UTILITIES

**112.1 General.** Refer to Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 113 RESERVED

## SECTION BC 114 VIOLATIONS

**114.1 General.** Refer to Chapter 2 of Title 28 of the *Administrative Code*.

**SECTION BC 115  
STOP WORK ORDER**

**NYC 115.1 General.** Refer to Chapter 2 of Title 28 of the *Administrative Code*.  
**NYC**  
⇒

**SECTION BC 116  
UNSAFE STRUCTURES AND EQUIPMENT**

**NYC 116.1 General.** Refer to Chapters 2 and 3 of Title 28 of the *Administrative Code*.  
**NYC**  
⇒



## CHAPTER 2

# DEFINITIONS

### SECTION BC 201 GENERAL

**201.1 Scope.** Unless otherwise expressly stated, the following words and terms shall, for the purposes of this code, have the meanings shown in this chapter.

**201.2 Interchangeability.** Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

**201.3 Terms defined in other codes.** Where terms are not defined in this code and are defined in the *New York City Fuel Gas Code*, *New York City Fire Code*, *New York City Mechanical Code*, *New York City Electrical Code* or *New York City Plumbing Code*, such terms shall have the meanings ascribed to them as in those codes.

**201.4 Terms not defined.** Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies.

### SECTION BC 202 DEFINITIONS

**1968 OR PRIOR CODE BUILDINGS OR STRUCTURES (PRIOR CODE BUILDINGS).** See Section 28-101.5 of the *Administrative Code*.

**500-YEAR FLOOD ELEVATION.** See Section G201.2.

**AAC MASONRY.** See Section 2102.1.

**ACCESSIBLE.** See Section 1102.1.

**ACCESSIBLE MEANS OF EGRESS.** See Section 1002.1.

**ACCESSIBLE ROUTE.** See Section 1102.1.

**ACCESSIBLE UNIT.** See Section 1102.

**ACCIDENT.** See Section 3302.

**ACCREDITATION BODY.** See Section 2302.1.

**ADDITION.** An alteration of a building in existence that increases its exterior dimensions, including but not limited to an extension or increase in floor area or height of the building (including an increase in area or height resulting from the construction of a rooftop structure or rooftop mechanical equipment). See Section 28-101.5 of the *Administrative Code*.

**ADHERED MASONRY VENEER.** See Section 1402.1.

**ADJUSTMENT (SCAFFOLD).** See Section 3302.

**ADMINISTRATIVE CODE.** The *Administrative Code of the City of New York*.

**AEROSOL.** See Section 307.2.

**Level 1 aerosol products.** See Section 307.2.

**Level 2 aerosol products.** See Section 307.2.

**Level 3 aerosol products.** See Section 307.2.

**AGGREGATE.** See Section 1502.1.

**AGRICULTURAL, BUILDING.** A structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products. This structure shall not be a place of human habitation or a place of employment where agricultural products are processed, treated or packaged, nor shall it be a place used by the public.

**AIR-INFLATED STRUCTURE.** See Section 3102.2.

**AIR-SUPPORTED STRUCTURE.** See Section 3102.2.

**Double skin.** See Section 3102.2.

**Single skin.** See Section 3102.2.

**AISLE.** See Section 1002.1.

**AISLE ACCESSWAY.** See Section 1002.1.

**ALARM NOTIFICATION APPLIANCE.** See Section 902.1.

**ALARM SIGNAL.** See Section 902.1.

**ALARM VERIFICATION FEATURE.** See Section 902.1.

**ALLOWABLE STRESS DESIGN.** See Section 1602.1.

**ALTERATION.** Any construction, addition, change of use or occupancy, or renovation to a building or structure in existence. See Section 28-101.5 of the *Administrative Code*.

**ALTERNATE LOAD PATH.** See Section 1614.1.

**ALTERNATE LOAD PATH METHOD.** See Section 1614.1.

**ALTERNATING TREAD DEVICE.** See Section 1002.1.

**AMBULATORY HEALTH CARE FACILITY.** Buildings or portions thereof used to provide medical, surgical, psychiatric, nursing or similar care on a less than 24-hour basis to individuals who are rendered incapable of self-preservation.

**ANCHOR.** See Section 2102.1.

**ANCHOR BUILDING.** See Section 402.2.

**ANCHORED MASONRY VENEER.** See Section 1402.1.

**ANNULAR SPACE.** See Section 702.1.

**ANNUNCIATOR.** See Section 902.1.

**APARTMENT.** See Section 310.2.

**APARTMENT, STUDENT.** See Section 310.2.

**APPROVED.** Acceptable to the commissioner. In reference to construction documents, the determination by the department after full examination that submitted construction documents comply with this code and other applicable laws and rules. In reference to materials, the determination by the commissioner that material is acceptable for its intended use. See Section 28-101.5 of the *Administrative Code*.

## DEFINITIONS

**APPROVED AGENCY.** An established and recognized agency, or other qualified person, engaged in conducting tests or furnishing inspection services, when approved pursuant to department rules as qualified to perform or witness identified testing or inspection services. See Chapter 1 of Title 28 of the *Administrative Code*.

**APPROVED FABRICATOR.** See Section 1702.1.

**APPROVED INSPECTION AGENCY.** An approved agency that is approved by the department as qualified to perform one or more of the inspections required by this code. See Chapter 1 of Title 28 of the *Administrative Code*.

**APPROVED TESTING AGENCY.** An approved agency that is approved by the department as qualified to test and evaluate the performance of one or more of the materials regulated in their use by this code. Such term shall include, when approved pursuant to department rules, a third-party testing or certification agency, evaluation agency, testing laboratory, testing service, licensed concrete testing laboratory, or other entity concerned with product evaluation. See Chapter 1 of Title 28 of the *Administrative Code*.

**ARCHITECT.** A person licensed and registered to practice the profession of architecture under the *Education Law of the State of New York*.

**ARCHITECTURAL TERRA COTTA.** See Section 2102.1.

**AREA.** See Section 2102.1.

**Bedded.** See Section 2102.1.

**Gross cross-sectional.** See Section 2102.1.

**Net cross-sectional.** See Section 2102.1.

**AREA, BUILDING.** See Section 502.1.

**AREA OF RESCUE ASSISTANCE.** See Section 1002.1.

**AREA OF SPECIAL FLOOD HAZARD.** See Section G201.2.

**AREAWAY.** See Section 3201.8.

**ARTICULATING BOOM CRANE.** See Section 3302.1.

**ASPECT RATIO.** See Section 1614.1.

**ASSISTED RESCUE PATH.** See Section 1002.1.

**ATRIUM.** See Section 404.1.1.

**ATTIC.** The space between the ceiling beams of the top story and the roof rafters.

**AUDIBLE ALARM NOTIFICATION APPLIANCE.** See Section 902.1.

**AUTOCLAVED AERATED CONCRETE (AAC).** See Section 2102.1.

**AUTOMATIC.** See Section 902.1.

**AUTOMATIC FIRE-EXTINGUISHING SYSTEM.** See Section 902.1.

**AUTOMATIC SMOKE DETECTION SYSTEM.** See Section 902.1.

**AUTOMATIC SPRINKLER SYSTEM.** See Section 902.1.

**AVERAGE AMBIENT SOUND LEVEL.** See Section 902.1.

**AWNING.** An architectural projection that provides weather protection, identity or decoration and is wholly supported by the building to which it is attached. An awning is comprised of a lightweight frame structure over which a covering is attached.

**AXIS OF ROTATION.** See Section 3302.1.

**AXLE.** See Section 3302.1.

**A-ZONE.** See Section G201.2.

**BACKING.** See Section 1402.1.

**BALCONY, EXTERIOR.** See Section 1602.1.

**BALED COTTON.** See Section 307.2.

**BALED COTTON, DENSELY PACKED.** See Section 307.2.

**BALLAST.** See Section 1502.1.

**BARRICADE.** See Section 307.2.

**Artificial barricade.** See Section 307.2.

**Natural barricade.** See Section 307.2.

**BASE (MOUNTING).** See Section 3302.1.

**BASE FLOOD.** See Section G201.2.

**BASE FLOOD ELEVATION.** See Section G201.2.

**BASEMENT.** A story partly below the grade plane and having less than one-half its clear height (measured from finished floor to finished ceiling) below the grade plane (see definitions of "Story" in Section BC 202 and "Story above grade plane" in Section 502.1).

**BASEMENT (FOR FLOOD ZONE PURPOSES).** See Section G201.2.

**BEARER (PUTLOG).** See Section 3302.1.

**BED JOINT.** See Section 2102.1.

**BEDROCK.** See Section 1802.3.

**Hard sound rock (Class 1a).** See Section 1802.3.

**Medium hard rock (Class 1b).** See Section 1802.3.

**Intermediate rock (Class 1c).** See Section 1802.3.

**Soft rock (Class 1d).** See Section 1802.3.

**BLEACHERS.** See Section 1002.1.

**BOARDER (ROOMER, LODGER).** See Section 310.2.

**BOILING POINT.** See Section 307.2.

**BOND BEAM.** See Section 2102.1.

**BOOM.** See Section 3302.1.

**BOOM POINT.** See Section 3302.1.

**BRACED WALL LINE.** See Section 2302.1.

**BRACED WALL PANEL.** See Section 2302.1.

**BRAKE.** See Section 3302.1.

**BREAKAWAY WALL.** See Section G201.2.

**BRICK.** See Section 2102.1.

**Calcium silicate (sand lime brick).** See Section 2102.1.

**Clay or shale.** See Section 2102.1.

**Concrete.** See Section 2102.1.

➔ **BUCKET HOIST.** See Section 3302.1.

➔ **BUILDING.** Any structure used or intended for supporting or sheltering any use or occupancy. The term shall be construed as if followed by the phrase “structure, premises, lot or part thereof” unless otherwise indicated by the text. See Section 28-101.5 of the *Administrative Code*.

➔ **BUILDING ELEMENT.** See Section 702.1.

➔ **BUILDING LINE.** The line established by law, beyond which a building shall not extend, except as specifically provided by law.

➔ **BUILT-UP ROOF COVERING.** See Section 1502.1.

NYC **BULKHEAD.** See Section 1502.1.

NYC **BUTTRESS.** See Section 2102.1.

NYC **CABARET.** Any room, place or space in which any musical entertainment, singing, dancing or other similar amusement is permitted in connection with an eating and drinking establishment.

**CABLE-RESTRAINED, AIR-SUPPORTED STRUCTURE.** See Section 3102.2.

NYC **CABLEWAY.** See Section 3302.1.

NYC **CANOPY.** A permanent structure or architectural projection of rigid construction over which a covering is attached that provides weather protection, identity or decoration, which shall be structurally independent or supported by attachment to a building on one end and by not fewer than one stanchion at the outer end.

➔ **CARBON DIOXIDE EXTINGUISHING SYSTEMS.** See Section 902.1.

NYC **CARBON MONOXIDE ALARM.** See Section 902.1.

NYC **CARBON MONOXIDE DETECTOR.** See Section 902.1.

NYC **CARBON MONOXIDE PRODUCING EQUIPMENT.** See Section 902.1.

NYC **CARPORT.** See Section 406.1.2.

**CAST STONE.** See Section 2102.1.

**CEILING LIMIT.** See Section 902.1.

**CEILING RADIATION DAMPER.** See Section 702.1.

NYC **CELL.** See Sections 408.1.1 and 2102.1.

➔ **CELL TIER.** See Section 408.1.1.

NYC **CELLAR.** See Section 502.1.

➔ **CEMENT PLASTER.** See Section 2502.1.

**CERAMIC FIBER BLANKET.** See Section 721.1.1.

NYC **CERTIFICATE OF APPROVAL.** See Section 3302.1.

NYC **CERTIFICATE OF COMPLIANCE.** See Section 1702.1 of this code and Section 28-101.5 of the *Administrative Code*.

**CERTIFICATE OF ON-SITE INSPECTION.** See Section 3302.1. NYC NYC NYC

**CERTIFICATE OF OPERATION.** See Section 3302.1.

**CHILD CARE FACILITIES.** See Section 308.3.1.

**CHIMNEY.** See Section 2102.1.

**CHIMNEY TYPES.** See Section 2102.1.

**High-heat appliance type.** See Section 2102.1.

**Low-heat appliance type.** See Section 2102.1.

**Masonry type.** See Section 2102.1.

**Medium-heat appliance type.** See Section 2102.1.

**CIRCULATION PATH.** See Section 1102.1.

**CITY.** City of New York. NYC NYC NYC

**CLADDING.** See “Components and cladding.”

**CLAMSHELL.** See Section 3302.1.

**CLAYS.** See Section 1802.3.

**Hard (Class 4a).** See Section 1802.3.

**Stiff (Class 4b).** See Section 1802.3.

**Medium (Class 4c).** See Section 1802.3.

**Soft (Class 4d).** See Section 1802.3.

**CLEAN AGENT.** See Section 902.1.

**CLEANOUT.** See Section 2102.1.

**CLIMBING/JUMPING.** See Section 3302.

**CLINIC, OUTPATIENT.** See Section 304.1.1.

**CLOSED-CIRCUIT TELEPHONE.** See Section E102.1. NYC

**CLOSED SYSTEM.** See Section 307.2.

**COASTAL A-ZONE.** See Section G201.2.

**COLLAPSE.** See Section 1614.1.

**COLLAR JOINT.** See Section 2102.1.

**COLLECTING SAFE AREA.** See Section 1002.1.

**COLLECTOR.** See Section 2302.1.

**COMBINATION FIRE/SMOKE DAMPER.** See Section 702.1.

**COMBINATION SIGN.** See Section H102.1.

**COMBINED HEAT AND POWER SYSTEMS.** See Section 502.1. NYC NYC NYC

**COMBUSTIBLE DUST.** See Section 307.2.

**COMBUSTIBLE FIBERS.** See Section 307.2.

**COMBUSTIBLE LIQUID.** See Section 307.2.

**Class II.** See Section 307.2.

**Class IIIA.** See Section 307.2.

**Class IIIB.** See Section 307.2.

**COMMERCIAL COOKING SYSTEM.** See Section 902.1. NYC NYC NYC

**COMMERCIAL TRUCK-MOUNTED CRANE (BOOM TRUCK).** See Section 3302.1. NYC NYC NYC



## DEFINITIONS

NYC NYC NYC NYC	<b>COMMISSIONER.</b> The Commissioner of Buildings of the City of New York or his or her duly authorized representative. See Section 28-101.5 of the <i>Administrative Code</i> .	
	<b>COMMON PATH OF EGRESS TRAVEL.</b> See Section 1002.1.	
	<b>COMMON USE.</b> See Section 1102.1.	
NYC ➔	<b>COMPETENT PERSON.</b> See Section 3302.1.	
	<b>COMPRESSED GAS.</b> See Section 307.2.	
NYC NYC NYC NYC NYC NYC	Nonliquefied compressed gases. See Section 307.2.	
	Liquefied compressed gases. See Section 307.2.	
	Compressed gases in solution. See Section 307.2.	
	Compressed gas mixtures. See Section 307.2.	
	<b>COMPRESSIVE STRENGTH OF MASONRY.</b> See Section 2102.1.	
NYC ➔	<b>CONCEALED SPACES.</b> See Section 702.1.	
	<b>CONCRETE CARBONATE AGGREGATE.</b> See Section 721.1.1.	
	<b>CONCRETE, CELLULAR.</b> See Section 721.1.1.	
	<b>CONCRETE, LIGHTWEIGHT AGGREGATE.</b> See Section 721.1.1.	
	<b>CONCRETE, PERLITE.</b> See Section 721.1.1.	
	<b>CONCRETE, SAND-LIGHTWEIGHT.</b> See Section 721.1.1.	
	<b>CONCRETE, SILICEOUS AGGREGATE.</b> See Section 721.1.1.	
➔	<b>CONCRETE, VERMICULITE.</b> See Section 721.1.1.	
NYC ➔	<b>CONCRETE WASHOUT WATER.</b> See Section 3302.	
NYC	<b>CONGREGATE LIVING UNIT.</b> See Section 310.2.	
	<b>CONNECTOR.</b> See Section 2102.1.	
	<b>CONSTANTLY ATTENDED LOCATION.</b> See Section 902.1.	
NYC NYC NYC NYC NYC	<b>CONSTRUCTION.</b> See Section 3302.1.	
NYC NYC NYC NYC	<b>CONSTRUCTION DOCUMENTS.</b> Plans and specifications and other written, graphic and pictorial documents, prepared or assembled for describing the design, location, physical characteristics, and other elements of the project necessary for obtaining a building permit. See Section 28-101.5 of the <i>Administrative Code</i> .	
	<b>CONSTRUCTION TYPES.</b> See Section 602.	
	<b>Type I.</b> See Section 602.2.	
	<b>Type II.</b> See Section 602.2.	
	<b>Type III.</b> See Section 602.3.	
	<b>Type IV.</b> See Section 602.4.	
	<b>Type V.</b> See Section 602.5.	
➔	<b>CONTINUOUS GAS-DETECTION SYSTEM.</b> See Section 415.2.	
	<b>CONTROL AREA.</b> See Section 307.2.	
	<b>CONTROLLED LOW-STRENGTH MATERIAL.</b> A self-compacted, cementitious material used primarily as a backfill in place of compacted fill.	
	<b>CONVENTIONAL LIGHT-FRAME CONSTRUCTION.</b> See Section 2302.1.	
	<b>CORNER SCAFFOLD (ANGLE SCAFFOLD).</b> See Section 3302.1.	NYC NYC
	<b>CORRIDOR.</b> See Section 1002.1.	
	<b>CORRIDOR, INTERIOR.</b> See Section 1002.1.	NYC NYC NYC
	<b>CORRIDOR, PUBLIC.</b> See Section 1002.1.	
	<b>CORROSION RESISTANCE.</b> The ability of a material to withstand deterioration of its surface or its properties when exposed to its environment.	
	<b>CORROSIVE MATERIAL.</b> See Section 307.2.	NYC NYC NYC
	<b>COUNTERWEIGHT.</b> See Section 3302.1.	
	<b>COURT.</b> An open, uncovered space, unobstructed to the sky, bounded on three or more sides by exterior building walls or other enclosing devices.	
	<b>COVER.</b> See Section 2102.1.	
	<b>COVERED MALL BUILDING.</b> See Section 402.2.	
	<b>Mall.</b> See Section 402.2.	
	<b>Open mall.</b> See Section 402.2.	
	<b>Open mall building.</b> See Section 402.2.	
	<b>CRANE.</b> See Section 3302.1.	NYC NYC NYC
	<b>CRAWLER CRANE.</b> See Section 3302.1.	
	<b>CRIPPLE WALL.</b> See Section 2302.1.	
	<b>CRITICAL PICK.</b> See Section 3302.	NYC NYC NYC
	<b>CROSS AISLE.</b> See Section 1002.1.	
	<b>CRYOGENIC FLUID.</b> See Section 307.2.	
	<b>CURB LINE.</b> See Section 3201.8.	NYC NYC NYC NYC NYC
	<b>CURTAIN WALL.</b> See Section 1402.1.	
	<b>CUSTODIAL CARE FACILITY.</b> See Section 310.2.	
	<b>DALLE GLASS.</b> See Section 2402.1.	
	<b>DAMPER.</b> See Section 702.1.	
	<b>DAMPPROOFING.</b> See Section 1801.3.	NYC ↩
	<b>DAY BOX.</b> See Section 307.2.	
	<b>DEAD END.</b> See Section 1002.1.	NYC
	<b>DEAD LOADS.</b> See Section 1602.1.	
	<b>DEBRIS.</b> See Section 3302.	NYC NYC NYC NYC NYC
	<b>DEBRIS NET OR NETTING.</b> See Section 3302.1.	
	<b>DECK.</b> See Section 1602.1.	
	<b>DECORATIVE GLASS.</b> See Section 2402.1.	
	<b>DECORATIVE MATERIALS.</b> All materials applied over the building interior finish for decorative, acoustical or other effect (such as curtains, draperies, fabrics, streamers and surface coverings), and all other materials utilized for decorative effect (such as batting, cloth, cotton, hay, stalks, straw, vines, leaves, trees, moss and similar items), including foam plastics	



and materials containing foam plastics. Decorative materials do not include floor coverings, ordinary window shades, interior finish and materials 0.025 inch (0.64 mm) or less in thickness applied directly to and adhering tightly to a substrate.

**DECORATIVE SHROUD.** See Section 2102.1.‡

**DEEP FOUNDATIONS.** See Section 1801.3.‡

**Augered-cast-in-place piles.** See Section 1801.3.

**Caisson piles.** See Section 1801.3.

**Compacted concrete piles.** See Section 1801.3.

**Composite Piles.** See Section 1801.3.

**Concrete-filled steel pipe and tube piles.** See Section 1801.3.

**Driven uncased piles.** See Section 1801.3.

**Enlarged base piles.** See Section 1801.3.

**H-piles.** See Section 1801.3.

**Helical Piles.** See Section 1801.3.

**Micropile.** See Section 1801.3.

**DEFLAGRATION.** See Section 307.2.

**DELUGE SPRINKLER SYSTEM.** See Section 902.1.

**DEMOLITION.** See Section 3302.1.

**DEMOLITION, FULL.** See Section 3302.1.

**DEMOLITION, PARTIAL.** See Section 3302.1.

**DEPARTMENT.** Department of Buildings of the City of New York.

**DERRICK.** See Section 3302.1.

**DESIGN EARTHQUAKE GROUND MOTION.** See Section 1613.2.

**DESIGN FLOOD ELEVATION.** See Section G201.2.

**DESIGN STRENGTH.** See Sections 1602.1 and 2102.1.

**DETACHED BUILDING.** See Section 415.2.

**DETAILED PLAIN CONCRETE STRUCTURAL WALL.** See Section 1908.1.1.

**DETECTABLE WARNING.** See Section 1102.1.

**DETECTOR, HEAT.** See Section 902.1.

**DETONATION.** See Section 307.2.

**DETOXIFICATION FACILITIES.** See Section 308.3.1.

**DEVELOPMENT.** See Section G201.2.

**DEWATERING.** See Section 3302.1.

**DIAPHRAGM.** See Sections 1602.1 and 2302.1.

**Diaphragm, blocked.** See Section 1602.1.

**Diaphragm boundary.** See Section 1602.1.

**Diaphragm chord.** See Section 1602.1.

**Diaphragm, flexible.** See Section 1602.1.

**Diaphragm, rigid.** See Section 1602.1.

**Diaphragm, unblocked.** See Section 2302.1.

**DIMENSIONS.** See Section 2102.1.

**Actual.** See Section 2102.1.

**Nominal.** See Section 2102.1.

**Specified.** See Section 2102.1.

**DIRECT AND CONTINUING SUPERVISION.** See Section 28-401.3 of the *Administrative Code*.

**DIRECT EMPLOY.** See Section 28-401.3 of the *Administrative Code*.‡

**DISMANTLING.**‡. See Section 3302.1.

**DISPENSING.** See Section 307.2.

**DISPLAY SIGN.** See Section H102.1.

**DOOR, BALANCED.** See Section 1002.1.

**DRAFTSTOP.** See Section 702.1.

**DRAG STRUT.** See “Collector” at Section 2302.1.

**DRUM.** See Section 3302.1.

**DRY-CHEMICAL EXTINGUISHING SYSTEM.** See Section 902.1.

**DURATION OF LOAD.** See Section 1602.1.

**DWELLING.** A building or structure which is occupied in whole or in part as the home, residence or sleeping place of one or more families. See Section 310.2.

**DWELLING, MULTIPLE.** A dwelling which is either rented, leased, let or hired out, to be occupied, or is occupied, as the residence or home of three or more families living independently of each other. A multiple dwelling does not include a building used for occupancies in Group I-2, I-3 or I-4. See Section 310.2.

**DWELLING, ONE-FAMILY.** Any building or structure designed and occupied exclusively for residence purposes on a long-term basis for more than a month at a time by not more than one family. One-family dwellings shall also be deemed to include a dwelling located in a series of one-family dwellings each of which faces or is accessible to a legal street or public thoroughfare, provided that each such dwelling unit is equipped as a separate dwelling unit with all essential services, and also provided that each such unit is arranged so that it may be approved as a legal one-family dwelling. See Sections 310.2 and M102.1.

**DWELLING, TWO-FAMILY.** Any building or structure designed and occupied exclusively for residence purposes on a long-term basis for more than a month at a time by not more than two families. Two-family dwellings shall also be deemed to include a dwelling located in a series of two-family dwellings each of which faces or is accessible to a legal street or public thoroughfare, provided that each such dwelling is equipped as a separate dwelling with all essential services, and also provided that each such dwelling is arranged so that it may be approved as a legal two-family dwelling. See Sections 310.2 and M102.1.

**DWELLING UNIT.** A single unit consisting of one or more habitable rooms and occupied or arranged to be occupied as a unit separate from all other units within a dwelling. See Section 310.2.

**DWELLING UNIT (ACCESSIBILITY).** See Section 1102.1.

## DEFINITIONS

**DWELLING UNIT OR SLEEPING UNIT, MULTI-STORY.** See Section 1102.1.

⇒ **DWELLING UNIT OR SLEEPING UNIT, TYPE B.** See Section 1102.1.

NYC **EAVE HEIGHT, *h*.** See Section 1609.2.

⇒ **EGRESS COURT.** See Section 1002.1.

NYC **ELEMENT.** See Section 1614.1.

⇒ **EMERGENCY ALARM SYSTEM.** See Section 902.1.

**EMERGENCY CONTROL STATION.** See Section 415.2.

**EMERGENCY ESCAPE AND RESCUE OPENING.** See Section 1002.1.

**EMERGENCY VOICE/ALARM COMMUNICATIONS.** See Section 902.1.

**EMPLOYEE WORK AREA.** See Section 1102.1.

NYC **ENGINEER.** A person licensed and registered to practice the profession of engineering under the *Education Law of the State of New York*.

NYC **ENLARGEMENT.** An addition.

NYC **EQUIPMENT.** See Section 3302.1.

NYC **EQUIPMENT PLATFORM.** See Section 502.1.

⇒ **ERECTION.** See Section 3302.1.

**ESSENTIAL FACILITIES.** See Section 1602.1.

NYC **EXCAVATION.** See Section 3302.1.

**EXHAUSTED ENCLOSURE.** See Section 415.2.

NYC **EXISTING BUILDING OR STRUCTURE.** A completed building or structure in existence. See Section 28-101.5 of the *Administrative Code*.

NYC **EXISTING CONSTRUCTION.** See Section G201.2.

⇒ **EXIT.** See Section 1002.1.

**EXIT ACCESS.** See Section 1002.1.

**EXIT ACCESS DOORWAY.** See Section 1002.1.

**EXIT DISCHARGE.** See Section 1002.1.

**EXIT DISCHARGE, LEVEL OF.** See Section 1002.1.

**EXIT ENCLOSURE.** See Section 1002.1.

**EXIT, HORIZONTAL.** See Section 1002.1.

**EXIT PASSAGEWAY.** See Section 1002.1.

**EXPANDED VINYL WALL COVERING.** See Section 802.1.

**EXPLOSION.** See Section 307.2.

**EXPLOSIVE.** See Section 307.2.

**High explosive.** See Section 307.2.

**Low explosive.** See Section 307.2.

**Mass-detonating explosives.** See Section 307.2.

NYC **UN/DOTn,‡ United States Department of Transportation Class 1 Explosives.** See Section 307.2.

**Division 1.1.** See Section 307.2.

**Division 1.2.** See Section 307.2.

**Division 1.3.** See Section 307.2.

**Division 1.4.** See Section 307.2.

**Division 1.5.** See Section 307.2.

**Division 1.6.** See Section 307.2.

**EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS).** See Section 1402.1. NYC

**EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE.** See Section 1402.1. NYC

**EXTERIOR SURFACES.** See Section 2502.1.

**EXTERIOR WALL.** See Section 1402.1.

**EXTERIOR WALL COVERING.** See Section 1402.1.

**EXTERIOR WALL ENVELOPE.** See Section 1402.1.

**F RATING.** See Section 702.1.

**FABRIC PARTITION.** See Section 1602.1.

**FABRICATED ITEM.** Products and assemblies regulated by this code, that are custom manufactured, or built prior to their incorporation into the work at the job site. Fabricated items shall not include listed, labeled or approved products or assemblies. Materials produced in accordance with standard specifications referenced by this code, such as rolled structural steel shapes, steel-reinforcing bars, masonry units, and wood structural panels or in accordance with a standard, listed in Chapter 35, which provides requirements for quality control done under the supervision of a third-party quality control agency shall not be considered “fabricated items. See Section 1702.1. NYC

**FABRICATION AREA.** See Section 415.2.

**FACILITY.** See Section 1102.1.

**FACTORED LOAD.** See Section 1602.1.

**FAMILY.** See Section 310.2.

**FIBER CEMENT SIDING.** See Section 1402.1.

**FIBER REINFORCED POLYMER.** See Section 2602.1.

**Fiberglass Reinforced Polymer.** See Section 2602.1.

**FIBERBOARD.** See Section 2302.1.

**FILM SIGN.** See Section H102.

**FIRE ALARM BOX, MANUAL.** See Section 902.1.

**FIRE ALARM CONTROL UNIT.** See Section 902.1.

**FIRE ALARM SIGNAL.** See Section 902.1.

**FIRE ALARM SYSTEM.** See Section 902.1.

**FIRE AREA.** See Section 902.1.

**FIRE BARRIER.** See Section 702.1.

**FIRE COMMAND CENTER.** See Section 902.1.

**FIRE DAMPER.** See Section 702.1.

**FIRE DETECTOR, AUTOMATIC.** See Section 902.1.

**FIRE DOOR.** See Section 702.1.

**FIRE DOOR ASSEMBLY.** See Section 702.1.

**FIRE EXIT HARDWARE.** See Section 1002.1.



## DEFINITIONS

NYC	<b>GREEN ROOF SYSTEM.</b> See Section 1502.1.	
	<b>GRIDIRON.</b> See Section 410.2.	
	<b>GROSS LEASABLE AREA.</b> See Section 402.2.	
NYC NYC NYC NYC	<b>GROUND SIGN.</b> See Section H102.1.	
	<b>GROUP HOME.</b> See Section 310.2.	
	<b>GROUT.</b> See Section 2102.1.	
	<b>GROUTED MASONRY.</b> See Section 2102.1.	
	<b>Grouted hollow-unit masonry.</b> See Section 2102.1.	
	<b>Grouted multiwythe masonry.</b> See Section 2102.1.	
NYC NYC NYC NYC NYC	<b>GUARD.</b> See Sections 1002.1 and 1602.1.	
	<b>GUARDRAIL SYSTEM (SCAFFOLD).</b> See Section 3302.1.	
	<b>GUY.</b> See Section 3302.1.	
	<b>GYPSUM BOARD.</b> See Section 2502.1.	
	<b>GYPSUM PLASTER.</b> See Section 2502.1.	
	<b>GYPSUM VENEER PLASTER.</b> See Section 2502.1.	
NYC NYC NYC	<b>HABITABLE SPACE.</b> See Section 1202.1.	
	<b>HALOGENATED EXTINGUISHING SYSTEM.</b> See Section 902.1.	
NYC NYC	<b>HANDHELD DEVICE (DEMOLITION).</b> See Section 3302.	
	<b>HANDLING.</b> See Section 307.2.	
	<b>HANDRAIL.</b> See Section 1002.1.	
➔	<b>HARDBOARD.</b> See Section 2302.1.	
	<b>HAZARDOUS MATERIALS.</b> See Section 307.2.	
	<b>HAZARDOUS PRODUCTION MATERIAL (HPM).</b> See Section 415.2.	
➔	<b>HEAD JOINT.</b> See Section 2102.1.	
	<b>HEALTH HAZARD.</b> See Section 307.2.	
NYC NYC NYC	<b>HEAVY DUTY SCAFFOLD.</b> See Section 3302.	
	<b>HEAVY DUTY SIDEWALK SHED.</b> See Section 3302.1.	
➔	<b>HEIGHT, BUILDING.</b> See Section 502.1.	
	<b>HEIGHT, WALLS.</b> See Section 2102.1.	
NYC	<b>HELICAL PILES.</b> See Section 1801.3.	
	<b>HELIPORT.</b> See Section 412.2.	
	<b>HELISTOP.</b> See Section 412.2.	
NYC NYC NYC NYC NYC	<b>HEREAFTER.</b> On or after July 1, 2008.	
	<b>HERETOFORE.</b> Before July 1, 2008.	
	<b>HIGH-PRESSURE BOILER.</b> See Section 28-401.3 of the <i>Administrative Code</i> †.	
	<b>HIGH-RISE BUILDING.</b> A building with an occupied floor located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access.	
NYC ➔	<b>HIGHLY TOXIC MATERIAL.</b> See Section 307.2.	
NYC	<b>HISTORIC STRUCTURE.</b> See Section G201.2.	
NYC NYC	<b>HOISTING EQUIPMENT.</b> See Section 3302.1.	
	<b>HOISTING MACHINE.</b> See Section 3302.1.	
	<b>HOISTING MECHANISM.</b> See Section 3302.1.	
	<b>HOISTWAY.</b> See Section 2402.	NYC NYC NYC NYC NYC
	<b>HORIZONTAL ASSEMBLY.</b> See Section 702.1.	
	<b>HOSPITALS AND MENTAL HOSPITALS.</b> See Section 308.3.1.	
	<b>HOUSING UNIT.</b> See Section 408.1.1.	
	<b>HPM FLAMMABLE LIQUID.</b> See Section 415.2.	
	<b>HPM ROOM.</b> See Section 415.2.	
	<b>HURRICANE-PRONE REGIONS.</b> See Section 1609.2.	
	<b>IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH).</b> See Section 415.2.	↩
	<b>IMPACT LOAD.</b> See Section 1602.1.	
	<b>IMPORTANCE FACTOR, I.</b> See Section 1609.2.	NYC
	<b>INCOMPATIBLE MATERIALS.</b> See Section 307.2.	
	<b>INDUSTRIAL ROPE ACCESS.</b> See Section 3302.	➔ NYC
	<b>INERT GAS.</b> See Section 307.2.	
	<b>INITIATING DEVICE.</b> See Section 902.1.	
	<b>INSPECTION CERTIFICATE.</b> See Section 1702.1.	
	<b>INSTALLING/INSTALLATION/INSTALL (SCAFFOLD).</b> See Section 3302.	NYC NYC
	<b>INTENDED TO BE OCCUPIED AS A RESIDENCE.</b> See Section 1102.1.	
	<b>INTERIOR FINISH.</b> See Section 802.1.	
	<b>INTERIOR FLOOR FINISH.</b> See Section 802.1.	
	<b>INTERIOR FLOOR-WALL BASE.</b> See Section 802.1.	
	<b>INTERIOR SURFACES.</b> See Section 2502.1.	
	<b>INTERIOR WALL AND CEILING FINISH.</b> See Section 802.1.	
	<b>INTERLAYMENT.</b> See Section 1502.1.	
	<b>INTUMESCENT FIRE-RESISTANT COATINGS.</b> See Section 1702.1.	➔ NYC
	<b>JIB.</b> See Section 3302.1.	➔ NYC
	<b>JUMP (JUMPING).</b> See Section 3302.1.	↩ NYC
	<b>KEY ELEMENT.</b> See Section 1614.1.	
	<b>KITCHEN.</b> See Section 1202.1.	NYC
	<b>KITCHENETTE.</b> See Section 1202.1.	NYC
	<b>LABEL.</b> An identification applied to material by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the material, and the name and identification of the approved agency and that indicates that the representative sample of the material has been tested and evaluated by an approved agency.	NYC NYC NYC NYC NYC
	<b>LABELED.</b> Material to which has been attached a label, symbol or other identifying mark of the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indi-	NYC NYC NYC NYC NYC NYC NYC



NYC cates that a representative sample of the material has been  
 NYC tested and evaluated by an approved agency for compliance  
 NYC with nationally recognized standards or tests to determine  
 NYC suitable usage in a specified manner.

NYC **LABORATORY BUILDING.** See Section 424.4.

NYC **LABORATORY CHEMICAL.** See Section 419.4.†

NYC **LABORATORY, NONPRODUCTION.** See Section 424.4.

NYC **LABORATORY UNIT.** See Section 424.4.

NYC **LAY.** See Section 3302.1.

NYC **LETTER OF MAP AMENDMENT (LOMA).** See Section  
 NYC G201.2.

NYC **LETTER OF MAP REVISION (LOMR).** See Section  
 NYC G201.2.

NYC **LETTER OF MAP REVISION BASED ON FILL  
 (LOMR-F).** See Section G201.2.

**LIGHT-DIFFUSING SYSTEM.** See Section 2602.1.

NYC **LIGHT DUTY SCAFFOLD.** See Section 3302.

NYC **LIGHT DUTY SIDEWALK SHED.** See Section 3302.1.

**LIGHT-FRAME CONSTRUCTION.** A type of construction whose vertical and horizontal structural elements are primarily formed by a system of repetitive wood or cold-formed steel framing members.

**LIGHT-TRANSMITTING PLASTIC ROOF PANELS.**  
 See Section 2602.1.

**LIGHT-TRANSMITTING PLASTIC WALL PANELS.**  
 See Section 2602.1.

**LIMIT STATE.** See Section 1602.1.

NYC **LIMITED AREA SPRINKLER SYSTEM.** See Section  
 NYC 902.1.

NYC **LIMITED OIL BURNING BOILER ALTERATIONS.**  
 See Section 28-101.5 of the *Administrative Code*.

NYC **LIMITED PLUMBING ALTERATIONS.** See Section 28-  
 NYC 101.5 of the *Administrative Code*.

NYC **LIMITED SPRINKLER ALTERATIONS.** See Section  
 NYC 28-101.5 of the *Administrative Code*.

NYC **LIMITED STANDPIPE ALTERATIONS.** See Section  
 NYC 28-101.5 of the *Administrative Code*.

NYC **LIQUEFACTION.** See Section 1801.3.

**LIQUID.** See Section 415.2.

**LIQUID STORAGE ROOM.** See Section 415.2.

| **LIQUID USE, DISPENSING AND MIXING ROOM.** See  
 Section 415.2.

NYC **LISTED.** See Section 902.1 of this code and Section 28-  
 NYC 101.5 of the *Administrative Code*.

**LIVE LOADS.** See Section 1602.1.

**LIVE LOADS (ROOF).** See Section 1602.1.

➔ NYC **LOAD (WORKING).** See Section 3302.1.

**LOAD AND RESISTANCE FACTOR DESIGN (LRFD).**  
 See Section 1602.1.

**LOAD EFFECTS.** See Section 1602.1.

**LOAD FACTOR.** See Section 1602.1.

**LOAD RATING CHART.** See Section 3302.1.

**LOAD RATINGS.** See Section 3302.1.

**LOADS.** See Section 1602.1.

**LOCAL COLLAPSE.** See Section 1614.1.

| NYC

**LOT.** A portion or parcel of land considered as a unit.

**LOT LINE.** A line dividing one lot from another, or from a street or any public place.

**LOT, TAX.** A portion or parcel of land classified as such by the department of finance. Where a tax lot line shifts in a vertical plane, the commissioner shall determine the manner in which provisions of this code apply with respect to measurements to or from such tax lot lines, in order to protect public safety.

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**LOWER FLAMMABLE LIMIT (LFL).** See Section 415.2.

**LOWER LOAD BLOCK.** See Section 3302.1.

**LOWEST FLOOR.** See Section G201.2.

**MAILBOXES.** See Section E102.1.

**MAIN WIND FORCE-RESISTING SYSTEM.** See Section 1609.2.

**MAINTENANCE (SCAFFOLD).** See Section 3302.

**MAJOR BUILDING.** See Section 3302.

**MANUAL FIRE ALARM BOX.** See Section 902.1.

**MANUFACTURED HOME.** See Section G201.2.

**MANUFACTURED HOME PARK OR SUBDIVISION.**  
 See Section G201.2.

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**MANUFACTURER'S DESIGNATION.** An identification applied to material by the manufacturer indicating that the material complies with a specified standard or set of rules.

**MARK.** An identification applied to a product by the manufacturer indicating the name of the manufacturer and the function of a product or material.

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**MARKET VALUE OF STRUCTURE.** See Section G201.2.

**MARQUEE.** A permanent roofed structure attached to and supported by the building and that projects into the public right-of-way.

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**MASONRY.** See Section 2102.1.

**Ashlar masonry.** See Section 2102.1.

**Coursed ashlar.** See Section 2102.1.

**Glass unit masonry.** See Section 2102.1.

**Plain masonry.** See Section 2102.1.

**Random ashlar.** See Section 2102.1.

**Reinforced masonry.** See Section 2102.1.

**Solid masonry.** See Section 2102.1.

**Unreinforced (plain) masonry.** See Section 2102.1.

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## DEFINITIONS

NYC	<b>MASONRY UNIT.</b> See Section 2102.1.	
	<b>Clay.</b> See Section 2102.1.	
	<b>Concrete.</b> See Section 2102.1.	
	<b>Hollow.</b> See Section 2102.1.	
	<b>Solid.</b> See Section 2102.1.	
NYC	<b>MASS CONCRETE.</b> See Section 1902.1.†	
NYC	<b>MAST CLIMBER.</b> See Section 3302.1.	
NYC	<b>MASTIC FIRE-RESISTANT COATINGS.</b> See Section 1702.1.	
NYC	<b>MATERIAL HANDLING EQUIPMENT.</b> See Section 3302.1.	
NYC	<b>MATERIAL HOIST (MATERIAL HOISTING EQUIPMENT).</b> See Section 3302.1.	
NYC	<b>MAXIMUM CONSIDERED EARTHQUAKE GEOMETRIC MEAN (MCE<sub>G</sub>) PEAK GROUND ACCELERATIONS.</b> See Section 1613.2.	
NYC	<b>MAXIMUM CONSIDERED EARTHQUAKE (MEC) GROUND MOTION.</b> See Section 1613.2.	
NYC	<b>MEAN ROOF HEIGHT.</b> See Section 1609.2.	
	<b>MEANS OF EGRESS.</b> See Section 1002.1.	
	<b>MECHANICAL-ACCESS OPEN PARKING GARAGES.</b> See Section 406.3.2.	
NYC	<b>MECHANICAL DEMOLITION EQUIPMENT.</b> See Section 3302.	
NYC	<b>MECHANICAL EQUIPMENT SCREEN.</b> See Section 1502.1.	
	<b>MECHANICAL SYSTEMS.</b> See Section 1613.2.	
NYC	<b>MEDIUM DUTY SCAFFOLD.</b> See Section 3302.	
	<b>MEMBRANE-COVERED CABLE STRUCTURE.</b> See Section 3102.2.	
	<b>MEMBRANE-COVERED FRAME STRUCTURE.</b> See Section 3102.2.	
	<b>MEMBRANE PENETRATION.</b> See Section 702.1.	
	<b>MEMBRANE-PENETRATION FIRESTOP.</b> See Section 702.1.	
	<b>MENTAL HOSPITALS.</b> See Section 308.3.1.	
	<b>MERCHANDISE PAD.</b> See Section 1002.1.	
	<b>METAL COMPOSITE MATERIAL (MCM).</b> See Section 1402.1.	
	<b>METAL COMPOSITE MATERIAL (MCM) SYSTEM.</b> See Section 1402.1.	
	<b>METAL ROOF PANEL.</b> See Section 1502.1.	
	<b>METAL ROOF SHINGLE.</b> See Section 1502.1.	
	<b>MEZZANINE.</b> See Section 502.1.	
NYC	<b>MICROPILE.</b> See Section 1801.3.	
	<b>MINERAL BOARD.</b> See Section 721.1.1.	
	<b>MINERAL FIBER.</b> See Section 702.1.	
	<b>MINERAL WOOL.</b> See Section 702.1.	
	<b>MINOR ALTERATIONS.</b> See Section 3302.1.	NYC
	<b>MOBILE CRANE.</b> See Section 3302.1.	NYC
	<b>MOBILE SCAFFOLD.</b> See Section 3302.1.	NYC
	<b>MODIFIED BITUMEN ROOF COVERING.</b> See Section 1502.1.	
	<b>MORTAR.</b> See Section 2102.1.	
	<b>MORTAR, SURFACE-BONDING.</b> See Section 2102.1.	
	<b>MULTILEVEL ASSEMBLY SEATING.</b> See Section 1102.1.	
	<b>MULTIPLE-STATION ALARM DEVICE.</b> See Section 902.1.	
	<b>MULTIPLE-STATION SMOKE ALARM.</b> See Section 902.1.	
	<b>MULTIPOINT ADJUSTABLE SUSPENDED SCAFFOLD.</b> See Section 3302.1.	NYC
	<b>MULTISTORY UNIT.</b> See Section 1102.1.	NYC
	<b>NAILING, BOUNDARY.</b> See Section 2302.1.	NYC
	<b>NAILING, EDGE.</b> See Section 2302.1.	
	<b>NAILING, FIELD.</b> See Section 2302.1.	
	<b>NATIONAL GEODETIC VERTICAL DATUM (NGVD).</b> See Section G201.2.	NYC
	<b>NATURALLY DURABLE WOOD.</b> See Section 2302.1.	
	<b>Decay resistant.</b> See Section 2302.1.	
	<b>Termite resistant.</b> See Section 2302.1.	
	<b>NEW CONSTRUCTION.</b> See Section G201.2.	NYC
	<b>NOMINAL LOADS.</b> See Section 1602.1.	
	<b>NOMINAL SIZE (LUMBER).</b> See Section 2302.1.	
	<b>NONCOMBUSTIBLE MEMBRANE STRUCTURE.</b> See Section 3102.2.	←
	<b>NONRESIDENTIAL (FOR FLOOD ZONE PURPOSES).</b> See Section G201.2.	NYC
	<b>NORMAL TEMPERATURE AND PRESSURE (NTP).</b> See Section 415.2.	NYC
	<b>NORTH AMERICAN VERTICAL DATUM (NAVD).</b> See Section G201.2.	NYC
	<b>NOSING.</b> See Section 1002.1.	
	<b>NOTATIONS.</b> See Sections 1602.1 and 2102.1.	NYC
	<b>NURSING HOMES.</b> See Section 308.3.1.	↩
	<b>OCCUPANCY.</b> The purpose or activity for which a building or space is used or is designed, arranged or intended to be used.	NYC
	<b>OCCUPANT LOAD.</b> See Section 1002.1.	NYC
	<b>OCCUPANT SENSOR.</b> A device that detects the presence or absence of people within an area and causes lighting, equipment, or appliances to be regulated accordingly.	NYC
	<b>OCCUPIABLE SPACE.</b> See Section 1202.1.	NYC
	<b>OPEN EXTERIOR SPACE.</b> See Section 1002.1.	NYC
	<b>OPEN PARKING GARAGE.</b> See Section 406.3.2.	NYC
	<b>OPEN PARKING LOT.</b> See Section 406.7.2.	NYC

	<b>OPEN SYSTEM.</b> See Section 307.2.	
⇒	<b>ORDINARY PRECAST STRUCTURAL WALL.</b> See Section 1908.1.1.	
	<b>ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.</b> See Section 1908.1.1.	
NYC NYC	<b>ORDINARY REPAIRS.</b> See Section 28-105.4.2.1 of the <i>Administrative Code</i> .	
	<b>ORDINARY STRUCTURAL PLAIN CONCRETE WALL.</b> See Section 1908.1.1.	
	<b>ORGANIC PEROXIDE.</b> See Section 307.2.	
	<b>Class I.</b> See Section 307.2.	
	<b>Class II.</b> See Section 307.2.	
	<b>Class III.</b> See Section 307.2.	
	<b>Class IV.</b> See Section 307.2.	
	<b>Class V.</b> See Section 307.2.	
	<b>Unclassified detonable.</b> See Section 307.2.	
	<b>ORTHOGONAL.</b> See Section 1613.2.	
	<b>OTHER STRUCTURES.</b> See Section 1602.1.	
NYC NYC	<b>OUTRIGGER (CRANE).</b> See Section 3302.1.	
NYC NYC	<b>OUTRIGGER (SCAFFOLD).</b> See Section 3302.1.	
NYC NYC	<b>OUTRIGGER BEAM (THRUSTOUT).</b> See Section 3302.1.	
NYC NYC	<b>OUTRIGGER SCAFFOLD.</b> See Section 3302.1.	
NYC NYC NYC NYC	<b>OWNER.</b> Any person, agent, firm, partnership, corporation or other legal entity having a legal or equitable interest in, or control of the premises.	
	<b>OXIDIZER.</b> See Section 307.2.	
	<b>Class 1.</b> See Section 307.2.	
	<b>Class 2.</b> See Section 307.2.	
	<b>Class 3.</b> See Section 307.2.	
	<b>Class 4.</b> See Section 307.2.	
→	<b>OXIDIZING GAS.</b> See Section 307.2.	
	<b>PANEL (PART OF A STRUCTURE).</b> See Section 1602.1.	
	<b>PANIC HARDWARE.</b> See Section 1002.1.	
NYC NYC NYC NYC NYC NYC NYC NYC	<b>PARKING GARAGE.</b> A structure or portion of a structure, other than a private garage or carport, used for the parking or storage of motor vehicles.	
	<b>PARTIAL DEMOLITION.</b> See Section 3302.1.	
	<b>PARTICLE BOARD.</b> See Section 2302.1.	
	<b>PATIENT CARE AREA (FOR FLOOD ZONE PURPOSES).</b> See Section G201.2.	
→	<b>PENETRATION FIRESTOP.</b> See Section 702.1.	
→	<b>PENTHOUSE.</b> See Section 1502.1.	
NYC NYC NYC NYC NYC	<b>PERMIT.</b> An official document or certificate issued by the commissioner that authorizes performance of specified work or activity.	
	<b>PERSON.</b> An individual, partnership, corporation, or other legal entity.	
	<b>PERSONAL CARE SERVICE.</b> See Section 310.2.	
	<b>PERSONNEL HOIST.</b> See Section 3302.1.	NYC
	<b>PHOTOLUMINESCENT.</b> See Section 1002.1.	
	<b>PHOTOSENSOR.</b> A device that detects the presence of visible light.	NYC NYC
	<b>PHYSICAL HAZARD.</b> See Section 307.2.	
	<b>PHYSIOLOGICAL WARNING THRESHOLD LEVEL.</b> See Section 415.2.	
	<b>PINRAIL.</b> See Section 410.2.	←
	<b>PLASTIC, APPROVED.</b> See Section 2602.1.	←
	<b>PLASTIC GLAZING.</b> See Section 2602.1.	←
	<b>PLATFORM.</b> See Sections 410.2 and 3302.1.	NYC
	<b>POLE SIGN.</b> See Section H102.1.	NYC
	<b>POSITIVE ROOF DRAINAGE.</b> See Section 1502.1.	
	<b>POSTFIRE SMOKE PURGE SYSTEM.</b> See Section 902.1.	NYC NYC NYC NYC NYC
	<b>POSTFIRM DEVELOPMENT.</b> See Section G201.2.	NYC NYC NYC NYC
	<b>POSTFIRM STRUCTURE.</b> See Section G201.2.	←
	<b>POWER BUGGIES.</b> See Section 3302.1.	NYC
	<b>PREFABRICATED WOOD I-JOIST.</b> See Section 2302.1.	←
	<b>PREFIRM DEVELOPMENT.</b> See Section G201.2.	NYC NYC NYC NYC NYC NYC
	<b>PREFIRM STRUCTURE.</b> See Section G201.2.	←
	<b>PREMISES.</b> Land, improvements thereon, or any part thereof.	NYC NYC NYC NYC NYC
	<b>PRESIGNAL SYSTEM.</b> See Section 902.1.	←
	<b>PRESSURIZATION.</b> See Section 909.1.1.	NYC NYC NYC
	<b>PRESTRESSED MASONRY.</b> See Section 2102.1.	←
	<b>PRIMARY STRUCTURAL FRAME.</b> The primary structural frame shall include all of the following structural members:	←
	1. The columns;	
	2. Structural members having direct connections to the columns, including girders, beams, trusses and spandrels;	
	3. Members of the floor construction and roof construction having direct connections to the columns; and	
	4. Bracing members that are essential to the vertical stability of the primary structural frame under gravity loading, shall be considered part of the primary structural frame whether or not the bracing member carries gravity loads.	
	<b>PRISM.</b> See Section 2102.1.	←
	<b>PRIVATE GARAGE.</b> See Section 406.1.2.	NYC
	<b>PROJECTING SIGN.</b> See Sections 3201.8 and H102.1.	NYC
	<b>PROSCENIUM WALL.</b> See Section 410.2.	
	<b>PUBLIC ENTRANCE.</b> See Section 1102.1.	
	<b>PUBLIC-USE AREAS.</b> See Section 1102.1.	
	<b>PUBLIC WAY.</b> See Section 1002.1.	



## DEFINITIONS

**NYC** **PYROPHORIC MATERIAL.** See Section 307.2.

**NYC** **PYROTECHNIC MATERIAL.** See Section 307.2.

**NYC** **QUALIFIED PERSON.** See Section 3302.1.

**RAMP.** See Section 1002.1.

**RAMP-ACCESS OPEN PARKING GARAGES.** See Section 406.3.2.

**RECORD DRAWINGS.** See Section 902.1.

**NYC** **RECREATIONAL VEHICLE.** See Section G201.2.

**REFLECTIVE PLASTIC CORE FOIL INSULATION.** An insulation material packaged in rolls, that is less than  $\frac{1}{2}$  inch $\pm$  (1.7 mm) thick, with at least one exterior low emittance surface (0.1 or less) and a core material containing voids or cells.

**NYC** **REFUGE AREA.** See Section 1002.1.

**NYC** **REGISTERED DESIGN PROFESSIONAL.** An architect or engineer.

**NYC** **REGISTERED DESIGN PROFESSIONAL OF RECORD.** The registered design professional who prepared or supervised the preparation of applicable construction documents filed with the department.

**RELIGIOUS WORSHIP, PLACE OF.** A building or portion thereof intended for the performance of religious services.

**NYC** **REMOVING/REMOVAL/REMOVE (SCAFFOLD).** See Section 3302.

**REPAIR.** The reconstruction or renewal of any part of an existing building for the purpose of its maintenance.

**NYC** **REPAIR (SCAFFOLD).** See Section 3302.

**NYC** **REPLACEMENT (SCAFFOLD).** See Section 3302.

**NYC** **REQUIRED.** Required by this code.

**NYC** **REQUIRED STRENGTH.** See Sections 1602.1 and 2102.1.

**NYC** **REROOFING.** See Section 1502.1.

**RESIDENTIAL CARE/ASSISTED LIVING FACILITIES.** See Section 310.2.

**NYC** **RESIDENTIAL (FOR FLOOD ZONE PURPOSES).** See Section G201.2.

**RESISTANCE FACTOR.** See Section 1602.1.

**NYC** **RESPONSE RATIO.** See Section 1614.1.

**RESTRICTED ENTRANCE.** See Section 1102.1.

**NYC** **RETAINING WALL.** See Section 1801.3.

**RETRACTABLE AWNING.** See Section 3105.2.

**NYC** **RISK CATEGORY.** See definition for "Structural Occupancy Category." See Section 1602.1.

**NYC** **RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE ( $MCE_R$ ) GROUND MOTION RESPONSE ACCELERATIONS.** See Section 1613.2.

**ROOF ASSEMBLY.** See Section 1502.1.

**ROOF COVERING.** See Section 1502.1.

**ROOF COVERING SYSTEM.** See Section 1502.1.

**ROOF DECK.** See Section 1502.1.

**ROOF RECOVER.** See Section 1502.1.

**ROOF REPLACEMENT.** See Section 1502.1.

**ROOF SIGN.** See Section H102.1.

**ROOF VENTILATION.** See Section 1502.1.

**ROOFTOP STRUCTURE.** See Section 1502.1.

**ROOMING HOUSE.** See Section 310.2.

**ROPE.** See Section 3302.1.

**ROTATION.** See Section 1614.1.

**RUBBLE MASONRY.** See Section 2102.1.

**Coursed rubble.** See Section 2102.1.

**Random rubble.** See Section 2102.1.

**Rough or ordinary rubble.** See Section 2102.1.

**RUNBACK STRUCTURE.** See Section 3302.1.

**RUNNING BOND.** See Section 2102.1.

**SAFE AREA.** See Section 1002.1.

**SAFETY NETTING SYSTEM.** See Section 3302.

**SALLYPORT.** See Section 408.1.1.

**SAND DUNES.** See Section G201.2.

**SANDY GRAVEL AND GRAVELS.** See Section 1802.3.

**Dense (Class 2a).** See Section 1802.3.

**Medium (Class 2b).** See Section 1802.3.

**Loose (Class 6).** See Section 1802.3.

**SCAFFOLD.** See Section 3302.1.

**SCAFFOLD CONTROLLING ENTITY.** See Section 3302.

**SCISSOR STAIR.** See Section 1002.1.

**SEATING SECTION.** See Section 1002.1.

**SECONDARY MEMBERS.** The following structural members shall be considered secondary members and not part of the primary structural frame:

1. Structural members not having direct connections to the columns;
2. Members of the floor construction not having direct connections to the columns; and
3. Bracing members other than those that are part of the primary structural frame.

**SEISMIC DESIGN CATEGORY.** See Section 1613.2.

**SEISMIC-FORCE-RESISTING SYSTEM.** See Section 1613.2.

**SELF-CLOSING.** See Section 702.1.

**SELF-LUMINOUS.** See Section 1002.1.

**SELF-SERVICE STORAGE FACILITY.** See Section 1102.1.

**SERVICES.** See Section 1102.1.

**SLEEPING UNIT (ACCESSIBILITY).** See Section 1102.1.

**SMOKE.** See Section 909.1.1.

**SMOKE ALARM.** See Section 902.1.

**SMOKE BARRIER.** See Section 702.1.

**SMOKE COMPARTMENT.** See Section 702.1.

**SMOKE CONTROL MODE.** See Section 909.1.1.

**SMOKE CONTROL SYSTEM, MECHANICAL.** See Section 909.1.1.

**SMOKE CONTROL SYSTEM, PASSIVE.** See Section 909.1.1.

**SMOKE CONTROL ZONE.** See Section 909.1.1.

**SMOKE DAMPER.** See Section 702.1.

**SMOKE DETECTOR.** See Section 902.1.

**SMOKE-DEVELOPED INDEX.** See Section 802.1.

**SMOKE PARTITION.** See Section 702.1.

**SMOKE-PROTECTED ASSEMBLY SEATING.** See Section 1002.1.

**SMOKEPROOF ENCLOSURE.** See Section 902.1.

**SOIL AND FOUNDATION WORK (SOIL OR FOUNDATION WORK).** See Section 3302.

**SOLID.** See Section 415.2.

**SPECIAL AMUSEMENT BUILDING.** See Section 411.2.

**SPECIAL FLOOD HAZARD AREA.** See Section G201.2.

**SPECIAL INSPECTION.** See Section 1702.1.

**SPECIAL INSPECTION, CONTINUOUS.** See Section 1702.1.

**SPECIAL INSPECTION, PERIODIC.** See Section 1702.1.

**SPECIAL INSPECTOR.** An individual employed by a special inspection agency having required qualifications and authorized by department rules to perform or witness particular special inspections required by this code or by the rules of the department, including but not limited to a qualified registered design professional so authorized. See Section 1702.1 and Chapter 1 of Title 28 of the *Administrative Code*.

**SPECIFIC LOCAL LOAD.** See Section 1614.1.

**SPECIFIC LOCAL RESISTANCE METHOD.** See Section 1614.1.

**SPECIFIED.** See Section 2102.1.

**SPECIFIED COMPRESSIVE STRENGTH OF MASONRY ( $f'_m$ ). See Section 2102.1.**

**SPRAYED FIRE-RESISTANT MATERIALS.** See Section 1702.1.

**STACK BOND.** See Section 2102.1.

**STACK EFFECT.** See Section 909.1.1.

**STAGE.** See Section 410.2.

**STAIR.** See Section 1002.1.

**STAIRWAY.** See Section 1002.1.

## DEFINITIONS

	<b>STAIRWAY, EXTERIOR.</b> See Section 1002.1.	
	<b>STAIRWAY, INTERIOR.</b> See Section 1002.1.	
	<b>STAIRWAY, SPIRAL.</b> See Section 1002.1.	
NYC	<b>STANDARD CUBIC FEET (SCF).</b> See Section 307.2.	
NYC	<b>STANDARD GUARDRAIL SYSTEM (SCAFFOLD).</b> See Section 3302.1.	
NYC	<b>STANDPIPE, TYPES OF.</b> See Section 902.1.	
	<b>Automatic dry.</b> See Section 902.1.	
	<b>Automatic wet.</b> See Section 902.1.	
	<b>Manual dry.</b> See Section 902.1.	
	<b>Manual wet.</b> See Section 902.1.	
	<b>Semiautomatic dry.</b> See Section 902.1.	
	<b>STANDPIPE SYSTEM, CLASSES OF.</b> See Section 902.1.	
	<b>Class I system.</b> See Section 902.1.	
	<b>Class II system.</b> See Section 902.1.	
	<b>Class III system.</b> See Section 902.1.	
NYC	<b>START OF CONSTRUCTION.</b> See Section G201.2.	
	<b>STEEL CONSTRUCTION, COLD-FORMED.</b> See Section 2202.1.	
	<b>STEEL JOIST.</b> See Section 2202.1.	
	<b>STEEL MEMBER, STRUCTURAL.</b> See Section 2202.1.	
	<b>STEEP SLOPE.</b> A roof slope greater than two units vertical in 12 units horizontal (17-percent slope).	
→	<b>STONE MASONRY.</b> See Section 2102.1.	
	<b>Ashlar stone masonry.</b> See Section 2102.1.	
	<b>Rubble stone masonry.</b> See Section 2102.1.	
NYC	<b>STORAGE CABINET.</b> See Section 424.4.	
NYC	<b>STORAGE ROOM.</b> See Section 424.4.	
	<b>STORM SHELTER.</b> See Section 423.2.	
	<b>Community storm shelter.</b> See Section 423.2.	
	<b>Residential storm shelter.</b> See Section 423.2.	
NYC	<b>STORY.</b> That portion of a building included between the upper surface of a floor and the upper surface of the floor or roof next above (also see “Basement” and “Mezzanine”). It is measured as the vertical distance from top to top of two successive tiers of beams or finished floor surfaces and, for the topmost story, from the top of the floor finish to the top of the ceiling joists or, where there is not a ceiling, to the top of the roof rafters.	
→	<b>STORY ABOVE GRADE PLANE.</b> See Section 502.1.	
NYC	<b>STREET.</b> See Section 3201.8.	
NYC	<b>STREET FLOOR.</b> A floor, usually the principal entrance floor, that is not more than one-half story above or below grade at the location from which egress is provided to the street.	
NYC	<b>STREET LINE.</b> See Section 3201.8.	
⇒	<b>STRENGTH DESIGN.</b> See Section 1602.1.	
	<b>STRENGTH, NOMINAL.</b> See Sections 1602.1 and 2102.1.	
	<b>STRENGTH, REQUIRED.</b> See Sections 1602.1 and 2102.1.	
	<b>STRIPPING OPERATIONS.</b> See Section 3303.2.	NYC
	<b>STRUCTURAL COMPOSITE LUMBER.</b> See Section 2302.1.	←
	<b>Laminated veneer lumber (LVL).</b> See Section 2302.1.	
	<b>Parallel strand lumber (PSL).</b> See Section 2302.1.	
	<b>STRUCTURAL GLUED-LAMINATED TIMBER.</b> See Section 2302.1.	
	<b>STRUCTURAL NET (STRUCTURAL NETTING).</b> See Section 3302.1.	NYC
	<b>STRUCTURAL OCCUPANCY CATEGORY.</b> See Section 1602.1.	NYC
	<b>STRUCTURE.</b> That which is built or constructed, including among others: buildings, stadia, tents, reviewing stands, platforms, stagings, observation towers, radio towers, tanks, trestles, open sheds, shelters, fences and display signs. See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
	<b>SUBDIAPHRAGM.</b> See Section 2302.1.	NYC
	<b>SUBSTANTIAL DAMAGE.</b> See Section G201.2.	NYC
	<b>SUBSTANTIAL IMPROVEMENT.</b> See Section G201.2.	NYC
	<b>SUITE.</b> See Section 1002.1.	←
	<b>SUN CONTROL DEVICE.</b> An architectural projection that provides protection against solar radiation entering a building through glazed areas and is supported by the building to which it is attached. Sun control device includes, but is not limited to, a fixed, retractable or rotating sun control device. A fixed sun control device has no moving parts and is typically composed of horizontal overhangs or vertical fins. A retractable sun control device extends or retracts, and in the extended position casts a shadow on designated portions of the building. A rotating sun control device may be of fixed or adjustable length and pivots at its base. Sun control device shall not include awnings and canopies.	NYC
	<b>SUNROOM.</b> See Section 1202.1.	NYC
	<b>SUPERINTENDENT OF CONSTRUCTION.</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
	<b>SUPERSTRUCTURE.</b> See Section 3302.1.	NYC
	<b>SUPERVISING STATION.</b> See Section 902.1.	NYC
	<b>SUPERVISORY SERVICE.</b> See Section 902.1.	NYC
	<b>SUPERVISORY SIGNAL.</b> See Section 902.1.	NYC
	<b>SUPERVISORY SIGNAL-INITIATING DEVICE.</b> See Section 902.1.	NYC
	<b>SUPPORTED SCAFFOLD.</b> See Section 3302.1.	NYC
	<b>SUSPENDED SCAFFOLD.</b> See Section 3302.	NYC
	<b>SUSPENDED SCAFFOLD FOREMAN.</b> See Section 3302.1.	NYC
	<b>SUSTAINED WIND.</b> See Section 3302.1.	NYC
	<b>SWIMMING POOL.</b> See Section 3109.2.	NYC

NYC	<b>SWIMMING POOL, PRIVATE.</b> See Section 3109.2.	<b>TYPE B+NYC UNIT.</b> See Section 1102.1.	NYC
NYC	<b>SWIMMING POOL, PUBLIC.</b> See Section 3109.2.	<b>UNDERLAYMENT.</b> See Section 1502.1.	←
NYC	<b>SWING.</b> See Section 3302.1.	<b>UNDERPINNING.</b> See Section 1801.3.	NYC
NYC	<b>T RATING.</b> See Section 702.1.	<b>UNENCLOSED PERIMETER.</b> See Section 3302.	NYC
NYC	<b>TEMPORARY CONSTRUCTION.</b> See Section 3302.	<b>UNSTABLE (REACTIVE) MATERIAL.</b> See Section 307.2.	NYC
NYC	<b>TEMPORARY SIGN.</b> See Section H102.1.	<b>Class 1.</b> See Section 307.2.	
NYC	<b>TENABLE ENVIRONMENT.</b> See Section 909.1.1.	<b>Class 2.</b> See Section 307.2.	
NYC	<b>TENT.</b> A structure, enclosure or shelter, with or without side-walls or drops, constructed of fabric or pliable material supported in any manner except by air or the contents it protects.	<b>Class 3.</b> See Section 307.2.	
NYC	<b>THERMAL ISOLATION.</b> See Section 1202.1.	<b>Class 4.</b> See Section 307.2.	
NYC	<b>THERMALLY ISOLATED SUNROOM ADDITION.</b> See Section 1202.1.	<b>USE (USED).</b> The purpose for which a building, structure, or space is occupied or utilized, unless otherwise indicated by the text. Use (used) shall be construed as if followed by the words “or is intended, arranged, or designed to be used.”	NYC
NYC	<b>THERMOPLASTIC MATERIAL.</b> See Section 2602.1.	<b>UTILITY COMPANY OR PUBLIC UTILITY COMPANY.</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
NYC	<b>THERMOSETTING MATERIAL.</b> See Section 2602.1.	<b>UTILITY CORPORATION OR PUBLIC UTILITY CORPORATION.</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
NYC	<b>THIN-BED MORTAR.</b> See Section 2102.1.	<b>VALUE (OF ALTERATIONS, TO DETERMINE REQUIRED ACCESSIBILITY).</b> See Section 1102.1.	NYC
NYC	<b>THROUGH PENETRATION.</b> See Section 702.1.	<b>VALUE (OF ALTERATIONS, TO DETERMINE REQUIRED FIRE PROTECTION).</b> See Section 902.1.	NYC
NYC	<b>THROUGH-PENETRATION FIRESTOP SYSTEM.</b> See Section 702.1.	<b>VALUE (OF EXISTING BUILDING OR SPACE).</b> The value of an existing building shall be determined at the option of the applicant on the basis of one and one-quarter times the current assessed valuation of the building, as adjusted by the current State equalization rate, or on the basis of the current replacement cost of the building. The value of an existing space shall be determined on the basis of the current replacement cost of the space. Satisfactory evidence of current replacement cost shall be submitted to the commissioner. Where the alteration includes an enlargement, the value of the existing building shall be determined without including the value of the enlargement.	NYC
NYC	<b>TIE-DOWN (HOLD-DOWN).</b> See Section 2302.1.	<b>VAPOR-PERMEABLE MEMBRANE.</b> A material or covering having a permeance rating of 5 perms (52.9 10-10 kg/Pa.s. m <sup>2</sup> ) or greater, when tested in accordance with the desiccant method using Procedure A of ASTM E 96. A vapor-permeable material or covering permits the passage of moisture vapor.	NYC
NYC	<b>TIE, LATERAL.</b> See Section 2102.1.	<b>VAPOR RETARDER CLASS.</b> A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class shall be defined using the desiccant method of ASTM E 96 as follows:	NYC
NYC	<b>TIE, WALL.</b> See Section 2102.1.	<b>Class I:</b> 0.1 perm or less.	←
NYC	<b>TILE.</b> See Section 2102.1.	<b>Class II:</b> 0.1 < perm < 1.0 perm.	
NYC	<b>TILE, STRUCTURAL CLAY.</b> See Section 2102.1.	<b>Class III:</b> 1.0 < perm < 10 perm.	
NYC	<b>TIRES, BULK STORAGE OF.</b> See Section 902.1.	<b>VARIANCE.</b> See Section G201.2.	NYC
NYC	<b>TOOL.</b> See Section 3302.	<b>VAULT.</b> See Section 3201.8.	NYC
NYC	<b>TOWER.</b> See Section 3302.1.	<b>VEHICLE BARRIER SYSTEM.</b> See Section 1602.1.	NYC
NYC	<b>TOWER CRANE.</b> See Section 3302.1.		
NYC	<b>TOWNHOUSE.</b> A single-family dwelling constructed in a group of three or more attached units in which each unit extends from the foundation to roof and with open space on at least two sides.		
NYC	<b>TOXIC MATERIAL.</b> See Section 307.2.		
NYC	<b>TRANSIENT.</b> See Section 310.2.		
NYC	<b>TRANSIENT AIRCRAFT.</b> See Section 412.2.		
NYC	<b>TRANSIENT LODGING.</b> See Section E102.1.		
NYC	<b>TRANSIT.</b> See Section 3302.1.		
NYC	<b>TRAVEL.</b> See Section 3302.1.		
NYC	<b>TREATED WOOD.</b> See Section 2302.1.		
NYC	<b>Fire-retardant-treated wood.</b> See Section 2302.1.		
NYC	<b>Preservative-treated wood.</b> See Section 2302.1.		
NYC	<b>TRIM.</b> See Section 802.1.		
NYC	<b>TROUBLE SIGNAL.</b> See Section 902.1.		
NYC	<b>TWO-POINT SUSPENDED SCAFFOLD (SWING STAGE).</b> See Section 3302.1.		
NYC	<b>TYPE B UNIT.</b> See Section 1102.1.		



## DEFINITIONS

	<b>VEHICULAR GATE.</b> See Section 3110.2.	
	<b> veneer.</b> See Section 1402.1.	
	<b>VENTILATION.</b> The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.	
	<b>VINYL SIDING.</b> See Section 1402.1.	
	<b>VISIBLE ALARM NOTIFICATION APPLIANCE.</b> See Section 902.1.	
NYC	<b>V-ZONE.</b> See Section G201.2.	
NYC	<b>WALKABLE FLOOR (CONCRETE CONSTRUCTION).</b> See Section 3302.	
NYC	<b>WALKABLE FLOOR (PRECAST CONCRETE CONSTRUCTION).</b> See Section 3302.	
NYC	<b>WALKABLE FLOOR (STEEL CONSTRUCTION).</b> See Section 3302.	
NYC	<b>WALKWAY, PEDESTRIAN.</b> A walkway used exclusively as a pedestrian trafficway.	
	<b>WALL.</b> See Section 2102.1.	
	<b>Cavity wall.</b> See Section 2102.1.	
	<b>Composite wall.</b> See Section 2102.1.	
	<b>Dry-stacked, surface-bonded wall.</b> See Section 2102.1.	
	<b>Masonry-bonded hollow wall.</b> See Section 2102.1.	
	<b>Parapet wall.</b> See Section 2102.1.	
	<b>WALL, LOAD-BEARING.</b> Any wall meeting either of the following classifications:	
	1. Any metal or wood stud wall that supports more than 100 pounds per linear foot (1459 N/m) of vertical load in addition to its own weight.	
	2. Any masonry or concrete wall that supports more than 200 pounds per linear foot (2919 N/m) of vertical load in addition to its own weight.	
	<b>WALL, NONLOAD-BEARING.</b> Any wall that is not a load-bearing wall.	
	<b>WALL PIER.</b> See Section 1908.1.1.	
NYC	<b>WALL SIGN.</b> See Section H102.1.	
	<b>WATER-REACTIVE MATERIAL.</b> See Section 307.2.	
	<b>Class 1.</b> See Section 307.2.	
	<b>Class 2.</b> See Section 307.2.	
	<b>Class 3.</b> See Section 307.2.	
	<b>WATER-RESISTIVE BARRIER.</b> See Section 1402.1.	
NYC	<b>WATERPROOFING.</b> See Section 1801.3.	
	<b>WEATHER-EXPOSED SURFACES.</b> See Section 2502.1.	
	<b>WEB.</b> See Section 2102.1.	
	<b>WET-CHEMICAL EXTINGUISHING SYSTEM.</b> See Section 902.1.	
	<b>WHEELCHAIR SPACE.</b> See Section 1102.1.	
NYC	<b>WHEEL MOUNTED CRANE (MULTIPLE CONTROL STATIONS).</b> See Section 3302.1.	
	<b>WHEEL MOUNTED CRANE (SINGLE CONTROL STATION).</b> See Section 3302.1.	NYC
	<b>WIND-BORNE DEBRIS REGION.</b> See Section 1609.2.	
	<b>WINDER.</b> See Section 1002.1.	
	<b>WIRE BACKING.</b> See Section 2502.1.	
	<b>WIRELESS PROTECTION SYSTEM.</b> See Section 902.1.	
	<b>WOOD SHEAR PANEL.</b> See Section 2302.1.	
	<b>WOOD STRUCTURAL PANEL.</b> See Section 2302.1.	
	<b>Composite panels.</b> See Section 2302.1.	
	<b>Oriented strand board (OSB).</b> See Section 2302.1.	
	<b>Plywood.</b> See Section 2302.1.	
	<b>WORKING DECK (CONCRETE CONSTRUCTION).</b> See Section 3302.	NYC
	<b>WORKING DECK (DEMOLITION).</b> See Section 3302.	NYC
	<b>WORKING DECK (PRECAST CONCRETE CONSTRUCTION).</b> See Section 3302.	NYC
	<b>WORKING DECK (STEEL CONSTRUCTION).</b> See Section 3302.	NYC
	<b>WORK NOT CONSTITUTING MINOR ALTERATIONS OR ORDINARY REPAIRS.</b> See Section 28-105.4.2.1 of the <i>Administrative Code</i> .	NYC
	<b>WORKSTATION.</b> See Section 415.2.	
	<b>WRITING (WRITTEN).</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
	<b>WRITTEN NOTICE.</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC
	<b>WYTHE.</b> See Section 2102.1.	
	<b>YARD.</b> An open space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.	
	<b>ZONE.</b> See Section 902.1.	
	<b>ZONE, NOTIFICATION.</b> See Section 902.1.	
	<b>ZONING RESOLUTION.</b> See Section 28-101.5 of the <i>Administrative Code</i> .	NYC



## CHAPTER 3

# USE AND OCCUPANCY CLASSIFICATION

### SECTION BC 301 GENERAL

**301.1 Scope.** The provisions of this chapter shall control the classification of all buildings and structures, and spaces therein, as to use and occupancy.

### SECTION BC 302 CLASSIFICATION

**302.1 General.** Structures or portions of structures shall be classified with respect to occupancy in one or more of the groups listed below. A room or space that is intended to be occupied at different times for different purposes shall comply with all of the requirements that are applicable to each of the purposes for which the room or space will be occupied. Structures with multiple occupancies or uses shall comply with Section 508. Where a structure, or portion thereof, is proposed for a purpose which is not specifically provided for in this code, such structure, or portion thereof, shall be classified in the group which the occupancy most nearly resembles, according to the fire safety and relative hazard involved, and as approved by the commissioner.

1. Assembly (see Section 303): Groups A-1, A-2, A-3, A-4 and A-5.
2. Business (see Section 304): Group B.
3. Educational (see Section 305): Group E.
4. Factory and Industrial (see Section 306): Groups F-1 and F-2.
5. High Hazard (see Section 307): Groups H-1, H-2, H-3, H-4 and H-5.
6. Institutional (see Section 308): Groups I-1, I-2, I-3 and I-4.
7. Mercantile (see Section 309): Group M.
8. Residential (see Section 310): Groups R-1, R-2 and R-3.
9. Storage (see Section 311): Groups S-1 and S-2.
10. Utility and Miscellaneous (see Section 312): Group U.

For a listing of occupancy group classifications that corresponds with uses listed in the *New York City Zoning Resolution*, refer to department rules.

### SECTION BC 303 ASSEMBLY GROUP A

**303.1 Assembly Group A.** Assembly Group A occupancy includes, among others, the use of a building or structure or a portion thereof, excluding a dwelling unit, for the gathering of any number of persons for purposes such as civic, social or religious functions, recreation, food or drink consump-

tion, awaiting transportation, or similar group activities; or when occupied by 75 persons or more for educational or instructional purposes.

#### Exceptions:

1. A building or nonaccessory tenant space used for assembly purposes with an occupant load of fewer than 75 persons shall be classified as a Group B occupancy, except that the number of plumbing fixtures for such a building or space is permitted to be calculated in accordance with the requirements for assembly occupancies.
2. A room or space used for assembly purposes with an occupant load of fewer than 75 persons and accessory to another occupancy shall be classified as a Group B occupancy or as part of that occupancy, except that the number of plumbing fixtures for such a room or space is permitted to be calculated in accordance with the requirements for assembly occupancies.

Assembly occupancies shall include the following:

**A-1** Assembly uses, usually with fixed seating, intended for the production and viewing of the performing arts or motion pictures including, but not limited to:

Motion picture theaters  
Symphony and concert halls  
Television and radio studios admitting an audience  
Theaters

**A-2** Assembly uses intended for food and/or drink consumption including, but not limited to:

Banquet halls  
Cabarets  
Cafeterias, except as provided for in A-3  
Dance halls Night clubs Restaurants Taverns and bars

**A-3** Assembly uses intended for worship, recreation or amusement and other assembly uses not classified elsewhere in Group A including, but not limited to:

Amusement arcades  
Art galleries  
Bowling alleys  
Cafeterias for children up to and including the 12th grade  
Classrooms and instructional rooms with 75 persons or more; such rooms with fewer than 75 persons shall be classified as Group B or E  
Community halls  
Courtrooms  
Custodial care facilities with 75 or more persons, providing care to persons over the age of 2, where no more than four occupants are incapable of responding to an emergency situation without

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## USE AND OCCUPANCY CLASSIFICATION

NYC	physical assistance from staff
NYC	Dance studio or instruction (not including food or drink consumption)
	Exhibition halls
	Funeral parlors
	Gymnasiums (without spectator seating)
NYC	Religious houses of worship
	Indoor swimming pools (without spectator seating)
	Indoor tennis courts (without spectator seating)
⇒	Lecture halls
	Museums
	Waiting areas in transportation terminals
	Pool and billiard parlors
NYC	School auditoriums

**A-4** Assembly uses intended for viewing of indoor sporting events and activities with spectator seating including, but not limited to:

Arenas  
Skating rinks  
Swimming pools  
Tennis courts

**A-5** Assembly uses intended for participation in or viewing outdoor activities including, but not limited to:

Amusement park structures  
Bleachers  
Grandstands  
Stadiums

NYC **303.2 Certificate of Operation.** A Certificate of Operation shall be required, as per Section 28-117.1, for the following places of assembly:

1. Indoor places of assembly used or intended for use by 75 persons or more, including open spaces at 20 feet (6096 mm) or more above or below grade, such as roofs or roof terraces.
2. Outdoor places of assembly used and intended for use by 200 persons or more.

### SECTION BC 304 BUSINESS GROUP B

NYC **304.1 Business Group B.** Business Group B occupancy includes, among others, the use of a building or structure, or a portion thereof, for office, professional, service-type transactions, or for conducting public or civic services, including the incidental storage of records and accounts and the incidental storage of limited quantities of stocks of goods for office use or purposes. Business Group B occupancies shall include, but not be limited to, the following:

Airport traffic control towers  
Ambulatory health care facilities  
Animal hospitals, kennels and pounds  
Banks  
Barber and beauty shops  
Civic administration offices  
Clinic—outpatient, including group medical centers, and neighborhood family care centers  
Custodial care facilities with fewer than 75 persons, providing care to persons over the age of 2, where no

more than four occupants are incapable of responding to an emergency situation without physical assistance from staff  
Dry cleaning and laundries; pick-up and delivery stations and self-service  
Educational occupancies for students above the 12th grade, where not classified in Group A. Such occupancy may be used occasionally for educational purposes offered to children through the 12th grade  
Electronic data processing  
Laboratories; nonproduction testing and research, as per Section 424  
Libraries when not classified in Group E  
Motor vehicle showrooms  
Offices  
Post offices  
Photocopying and printing shops using electronic printing equipment  
Professional services (architects, attorneys, dentists, physicians, engineers, etc.)  
Radio and television stations not admitting an audience  
Telephone exchanges  
Training and skill development not within a school or academic program

**304.1.1 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

**CLINIC, OUTPATIENT.** Buildings or portions thereof used to provide medical care on less than a 24-hour basis to individuals who are not rendered incapable of self-preservation by the services provided.

### SECTION BC 305 EDUCATIONAL GROUP E

**305.1 Educational Group E.** Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by five or more persons at any one time for educational purposes offered to children through the 12th grade and where no more than two children are under the age of 2, including but not limited to the following:

Academies  
Day care facilities where no more than two children are under the age of 2  
Libraries accessory to Group E occupancies  
Schools

#### Exceptions:

1. Classrooms and instructional rooms with 75 or more persons shall be classified as Group A-3.
2. Day care services provided within a dwelling unit as described in Section 310.
3. Custodial care facilities with up to 30 children under the age of 2 are permitted to be classified as Group E when the rooms where such children are cared for are located on the level of exit discharge and each of these child care rooms has an exit door directly to the exterior.

**305.2 Reserved.**

## SECTION BC 306 FACTORY GROUP F

**306.1 Factory Industrial Group F.** Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair, cleaning, laundering or processing operations that are not classified as a Group H hazardous occupancy.

**NYC** Factory Industrial Group F occupancy also includes certain mechanical and/or electrical equipment rooms in accordance with Section 306.3.

**306.2 Factory Industrial F-1 Moderate-Hazard Occupancy.** Factory industrial uses which are not classified as Factory Industrial F-2 Low Hazard shall be classified as F-1 Moderate Hazard and shall include, but not be limited to, the following:

- ⇒ Aircraft (manufacturing, not to include repair)
- NYC** Aircraft repairs
- NYC** Automobiles and other motor vehicles, manufacturing
- NYC** Automobiles and other motor vehicles, repairs
- NYC** Bakeries
- ⇒ Beverages; over 16 percent alcohol content
- ⇒ Boats
- NYC** Boat repairs
- ⇒ Brooms or brushes
- Canvas or similar fabric
- NYC** Carpets and rugs
- NYC** Carpets and rugs, cleaning, using or storing solvents having a flash point between 100°F (38°C) and 138.2°F (59°C) (Tag closed cup)
- ⇒ Clothing
- Disinfectants
- NYC** Dry cleaning and dyeing using or storing solvents having a flash point between 100°F (38°C) and 138.2°F (59°C) (Tag closed cup)
- NYC** Electric generation plants
- ⇒ Engines (including rebuilding)
- NYC** Food processing, except meat slaughtering or preparation of fish for packing
- NYC** Furniture
- Hemp products
- ⇒ Jute products
- NYC** Laboratories; for production (moderate-hazard), that may involve the synthesis or storage of materials that constitute a physical or health hazard in quantities below those found in Tables 307.1(1) and 307.1(2)
- NYC** Leather products
- NYC** Metals; finishing, plating, grinding, sharpening, polishing, cleaning, rustproofing, heat treatment or similar processes
- NYC** Millwork (sash and door)
- Motion pictures filming (without spectators)
- Musical instruments
- Optical goods
- Paper mills or products
- Photographic film
- Plastic products
- Printing or publishing

Recreational vehicles

Refuse incineration

Shoes

Soaps and detergents

Textiles

Tobacco

Trailers

Upholstering

Wood; distillation

Woodworking (cabinet) using no more than 2 quarts (1.9 L) per day or storing no more than 20 gallons (75.7 L) of paint, varnish, lacquer or shellac

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### 306.3 Factory Industrial F-2 Low-hazard Occupancy.

Factory industrial uses that involve the cleaning, laundering, fabrication or manufacturing of noncombustible materials which during finishing, packing or processing do not involve a significant fire hazard shall be classified as F-2 occupancies and shall include, but not be limited to, the following:

- Appliances
- Athletic equipment
- Automobile laundries
- Automobile wrecking establishments
- Beverages; up to and including 16 percent alcohol content; bottling works
- Beverages; nonalcoholic
- Bicycles
- Brick and masonry
- Business machines
- Cameras and photo equipment
- Carpets and rugs, cleaning, using or storing solvents having a flash point above 138.2°F (59°C) (Tag closed cup)
- Ceramic products
- Construction and agricultural machinery
- Dry cleaning and dyeing using or storing solvents having a flash point above 138.2°F (59°C) (Tag closed cup)
- Electronics
- Food processing; meat slaughtering or preparation of fish for packing
- Foundries
- Glass products
- Gypsum
- Ice
- Laboratories; for production (low-hazard), that may involve the synthesis or storage of materials that constitute a physical or health hazard in quantities below those found in Tables 307.1(1) and 307.1(2)
- Laundries
- Machinery
- Mechanical and/or electrical equipment rooms that are neither identified as incidental uses in Table 509 nor classified as the occupancy within which they are located per Section 508.1
- Metal products (fabrication and assembly), not including flammable metals and alloys listed in Section 307
- Plastic products; nonflammable
- Printing; incidental to primary use, area not exceeding 2,000 square feet (185.8 m<sup>2</sup>)
- Television filming (without spectators)

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NYC 306.4 **Location restrictions.** Locations of spaces classified  
 NYC in Factory Group F may be restricted within a building con-  
 NYC taining a Group R occupancy pursuant to Section 510.8.

## SECTION BC 307 HIGH-HAZARD GROUP H

NYC 307.1 **High-Hazard Group H.** High-Hazard Group H occu-  
 pancy includes, among others, the use of a building or struc-  
 ture, or a portion thereof, that involves the manufacturing,  
 processing, generation or storage of materials that constitute  
 a physical or health hazard in quantities in excess of those  
 allowed in control areas complying with Section 414, based  
 on the maximum allowable quantity limits for control areas  
 set forth in Tables 307.1(1) and 307.1(2). Hazardous occu-  
 pancies are classified in Groups H-1, H-2, H-3, H-4 and H-5  
 and shall be in accordance with this section, the requirements  
 of Section 415 and the *New York City Fire Code*.

**Exceptions:** The following shall not be classified as  
 Group H, but shall be classified as the occupancy that they  
 most nearly resemble.

- NYC 1. Buildings and structures occupied for the applica-  
 tion of flammable finishes, provided that such  
 buildings or areas conform to the requirements of  
 Section 416 and the *New York City Fire Code*.
- NYC 2. Wholesale and retail sales and storage of flamma-  
 ble and combustible liquids in mercantile occu-  
 pancies conforming to the *New York City Fire  
 Code*.
3. Closed piping system containing flammable or  
 combustible liquids or gases utilized for the opera-  
 tion of machinery or equipment.
4. Cleaning establishments that utilize combustible  
 liquid solvents having a flash point of 140°F  
 (60°C) or higher in closed systems employing  
 equipment listed by an approved testing agency,  
 provided that this occupancy is separated from all  
 other areas of the building by 1-hour fire barriers  
 constructed in accordance with Section 707 or 1-

hour horizontal assemblies constructed in accor-  
 dance with Section 712, or both.

5. Cleaning establishments that utilize a liquid sol-  
 vent having a flash point at or above 200°F  
 (93°C).
6. Liquor stores and distributors without bulk stor-  
 age.
7. Refrigeration systems.
8. The storage or utilization of materials for agricul-  
 tural purposes on the premises.
9. Stationary batteries utilized for facility emergency  
 or standby power, uninterrupted power supply or  
 telecommunication facilities, provided that the  
 batteries are provided with safety venting caps and  
 ventilation is provided in accordance with the *New  
 York City Mechanical Code*. NYC
10. Corrosives shall not include personal or household  
 products in their original packaging used in retail  
 display or commonly used building materials. NYC
11. Buildings and structures occupied for aerosol stor-  
 age shall be classified as Group S-1, provided that  
 such buildings conform to the requirements of the  
*New York City Fire Code*. NYC
12. Display and storage of nonflammable solid and  
 nonflammable or noncombustible liquid hazard-  
 ous materials in quantities not exceeding the maxi-  
 mum allowable quantity per control area in Group  
 M or S occupancies complying with Section  
 414.2.5.
13. The storage of black powder, smokeless propellant  
 and small arms primers in Groups M and R-3 and  
 special industrial explosive devices in Groups B,  
 F, M and S, provided such storage conforms to the  
 quantity limits and requirements prescribed in the  
*New York City Fire Code*. NYC
14. Laboratories for nonproduction testing, research,  
 experimental, instructional or educational pur-  
 poses, in compliance with Section 424.



**TABLE 307.1(1)**  
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD<sup>a, j, m, n, q</sup>**

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MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED <sup>a</sup>	STORAGE <sup>b</sup>			USE-CLOSED SYSTEMS <sup>b</sup>			USE-OPEN SYSTEMS <sup>b</sup>		
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas SCF	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas SCF	Solid pounds (cubic feet)	Liquid gallons (pounds)	
Combustible liquid <sup>c, i, r</sup>	II IIIA IIIB	H-2 or H-3 H-2 or H-3 Not Applicable	Not Applicable	120 <sup>d, e</sup> 330 <sup>d, e</sup> 13,200 <sup>e, f</sup>	Not Applicable	Not Applicable	120 <sup>d</sup> 330 <sup>d</sup> 13,200 <sup>f</sup>	Not Applicable	Not Applicable	30 <sup>d</sup> 80 <sup>d</sup> 3,300 <sup>f</sup>	
Combustible fiber	Loose Baled <sup>s</sup>	H-3	(100) (1,000)	Not Applicable	Not Applicable	(100) (1,000)	Not Applicable	Not Applicable	(20) (200)	Not Applicable	
Cryogenics flammable	Not Applicable	H-2	Not Applicable	45 <sup>d</sup>	Not Applicable	Not Applicable	45 <sup>d</sup>	Not Applicable	Not Applicable	10 <sup>d</sup>	
Cryogenics oxidizing	Not Applicable	H-3	Not Applicable	45 <sup>d</sup>	Not Applicable	Not Applicable	45 <sup>d</sup>	Not Applicable	Not Applicable	10 <sup>d</sup>	
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4	H-1 H-1 H-1 or H-2 H-3	1 <sup>e, g</sup> 1 <sup>e, g</sup> 5 <sup>e, g</sup> 50 <sup>c, g</sup>	(1) <sup>e, g</sup> (1) <sup>e, g</sup> (5) <sup>e, g</sup> (50) <sup>c, g</sup>	Not Applicable	0.25 <sup>g</sup> 0.25 <sup>g</sup> 1 <sup>g</sup> 50 <sup>g</sup>	(0.25) <sup>g</sup> (0.25) <sup>g</sup> 1 <sup>g</sup> (50) <sup>g</sup>	Not Applicable	0.25 <sup>g</sup> 0.25 <sup>g</sup> 1 <sup>g</sup> Not Applicable	(0.25) <sup>g</sup> (0.25) <sup>g</sup> 1 <sup>g</sup> Not Applicable	
	Division 1.4G	H-3	125 <sup>d, e, l</sup>	Not Applicable		Not Applicable	Not Applicable		Not Applicable	Not Applicable	Not Applicable
	Division 1.5	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>		0.25 <sup>g</sup>	(0.25) <sup>g</sup>		0.25 <sup>g</sup>	0.25 <sup>g</sup>	
	Division 1.6	H-1	1 <sup>d, e, g</sup>	Not Applicable		Not Applicable	Not Applicable		Not Applicable	Not Applicable	Not Applicable
Flammable gas	Gaseous Liquefied	H-2	Not Applicable	Not Applicable	1,000 <sup>d, e</sup> Not Applicable	Not Applicable	Not Applicable (150) <sup>d, e</sup>	1,000 <sup>d, e</sup> Not Applicable	Not Applicable	Not Applicable	
Flammable liquids <sup>c, k</sup>	IA <sup>o</sup> IB and IC	H-2 or H-3	Not Applicable	30 <sup>d, e</sup> 120 <sup>d, e</sup>	Not Applicable	Not Applicable	30 <sup>d</sup> 120 <sup>d</sup>	Not Applicable	Not Applicable	10 <sup>d</sup> 30 <sup>d</sup>	
Combination Flammable liquid (IA <sup>o</sup> , IB, IC)	Not Applicable	H-2 or H-3	Not Applicable	120 <sup>d, e, h</sup>	Not Applicable	Not Applicable	120 <sup>d, h</sup>	Not Applicable	Not Applicable	30 <sup>d, h</sup>	
Flammable solids  Pigs, ingots, billets, heavy castings  Light castings, light metallic products  Scraps, shavings, powders, dusts All others	Not Applicable	H-3	1,000 <sup>d, e</sup>	Not Applicable	Not Applicable	1,000 <sup>d</sup>	Not Applicable	Not Applicable	1,000 <sup>d</sup>	Not Applicable	
			125 <sup>d, e</sup>			125 <sup>d</sup>			25 <sup>d</sup>		
			1 <sup>d, e</sup>			1 <sup>d</sup>			1 <sup>d</sup>		
			125 <sup>d, e</sup>			125 <sup>d</sup>			25 <sup>d</sup>		
Inert gas	Gaseous Liquefied	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Limited Not Limited	Not Applicable Not Applicable	Not Applicable Not Applicable	Not Limited Not Limited	Not Applicable Not Applicable	Not Applicable Not Applicable	
	Cryogenic inert	Not Applicable	Not Applicable	Not Applicable	Not Limited	Not Applicable	Not Applicable	Not Limited	Not Applicable	Not Applicable	
Organic peroxide <sup>p</sup>	Unclassified Detonable	H-1 H-2 H-3 H-3 Not Applicable Not Applicable	1 <sup>e, g</sup> 5 <sup>d, e</sup> 50 <sup>d, e</sup> 125 <sup>d, e</sup> Not Limited Not Limited	(1) <sup>e, g</sup> (5) <sup>d, e</sup> (50) <sup>d, e</sup> (125) <sup>d, e</sup> Not Limited Not Limited	Not Applicable	0.25 <sup>g</sup> 1 <sup>d</sup> 50 <sup>d</sup> 125 <sup>d</sup> Not Limited Not Limited	(0.25) <sup>g</sup> (1) <sup>d</sup> (50) <sup>d</sup> (125) <sup>d</sup> No Limited Not Limited	Not Applicable	0.25 <sup>g</sup> 1 <sup>d</sup> 10 <sup>d</sup> 25 <sup>d</sup> Not Limited Not Limited	(0.25) <sup>g</sup> (1) <sup>d</sup> (10) <sup>d</sup> (25) <sup>d</sup> Not Limited Not Limited	

(continued)



# USE AND OCCUPANCY CLASSIFICATION

**TABLE 307.1(1)—continued**  
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD<sup>a, j, m, n, q</sup>**

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED <sup>a</sup>	STORAGE <sup>b</sup>			USE-CLOSED SYSTEMS <sup>b</sup>			USE-OPEN SYSTEMS <sup>b</sup>	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas SCF	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas SCF	Solid pounds (cubic feet)	Liquid gallons (pounds)
Oxidizer	4	H-1	1 <sup>g</sup>	(1) <sup>e, g</sup>	Not Applicable	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	Not Applicable	0.25 <sup>g</sup>	(0.25) <sup>g</sup>
	3 <sup>k</sup>	H-2	10 <sup>d, e</sup>	(10) <sup>d, e</sup>		2 <sup>d</sup>	(2) <sup>d</sup>		2 <sup>d</sup>	(2) <sup>d</sup>
	2	H-3	250 <sup>d, e</sup>	(250) <sup>d, e</sup>		250 <sup>d</sup>	(250) <sup>d</sup>		50 <sup>d</sup>	(50) <sup>d</sup>
	1	H-3	4,000 <sup>e, f</sup>	(4,000) <sup>e, f</sup>		4,000 <sup>f</sup>	(4,000) <sup>f</sup>		1,000 <sup>f</sup>	(1,000) <sup>f</sup>
Oxidizing gas	Gaseous	H-3	Not Applicable	Not Applicable (150) <sup>d, e</sup>	1,500 <sup>d, e</sup>	Not Applicable	Not Applicable (150) <sup>d, e</sup>	1,500 <sup>d, e</sup>	Not Applicable	Not Applicable
	Liquefied				Not Applicable			Not Applicable		
Pyrophoric material <sup>p</sup> detonable	Not Applicable	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>	10 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	2 <sup>e, g</sup>	0	0
Pyrophoric material nondetonable	Not Applicable	H-2	4 <sup>e, g</sup>	(4) <sup>e, g</sup>	50 <sup>e, g</sup>	1 <sup>g</sup>	(1) <sup>g</sup>	10 <sup>e, g</sup>	0	0
Unstable (reactive) <sup>p</sup> detonable	4	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>	10 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	2 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>
	3	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>	10 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	2 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>
Unstable (reactive) nondetonable	4	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>	10 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	2 <sup>e, g</sup>	0.25 <sup>g</sup>	(0.25) <sup>g</sup>
	3	H-1 or H-2	5 <sup>d, e</sup>	(5) <sup>d, e</sup>	50 <sup>d, e</sup>	1 <sup>d</sup>	(1) <sup>d</sup>	10 <sup>d, e</sup>	1 <sup>d</sup>	(1) <sup>d</sup>
	2		50 <sup>d, e</sup>	(50) <sup>d, e</sup>	250 <sup>d, e</sup>	(50) <sup>d</sup>	250 <sup>d, e</sup>	10 <sup>d</sup>	(10) <sup>d</sup>	
	1	Not Applicable	Not Limited	Not Limited	750 <sup>d, e</sup>	Not Limited	Not Limited	Not Limited	Not Limited	Not Limited
Water-reactive detonable <sup>p</sup>	3	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>	Not Applicable	0.25 <sup>g</sup>	(0.25) <sup>g</sup>	Not Applicable	0.25 <sup>g</sup>	(0.25) <sup>g</sup>
	2	H-1	1 <sup>e, g</sup>	(1) <sup>e, g</sup>		0.25 <sup>g</sup>	(0.25) <sup>g</sup>		0.25 <sup>g</sup>	(0.25) <sup>g</sup>
Water-reactive nondetonable	3	H-2	5 <sup>d, e</sup>	(5) <sup>d, e</sup>	Not Applicable	5 <sup>d</sup>	(5) <sup>d</sup>	Not Applicable	1 <sup>d</sup>	(1) <sup>d</sup>
	2	H-3	50 <sup>d, e</sup>	(50) <sup>d, e</sup>		50 <sup>d</sup>	(50) <sup>d</sup>		10 <sup>d</sup>	(10) <sup>d</sup>
	1	Not Applicable	Not Limited	Not Limited		Not Limited	Not Limited		Not Limited	Not Limited

For SI: 1 cubic foot = 0.028 m<sup>3</sup>, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

- NYC** a. For use of control areas, see Section 2703.8.3 of the *New York City Fire Code*.
- b. The aggregate quantity in storage, handling and use shall not exceed the quantity listed for storage.
- c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs, consumer or industrial products, and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.
- NYC** d. Maximum allowable quantities, except for liquefied petroleum gas and flammable liquid motor fuel, shall be increased 100 percent in buildings protected throughout by a sprinkler system. Where Note e also applies, the increase for both notes shall be applied accumulatively.
- NYC** e. Maximum allowable quantities, except for liquefied petroleum gas and flammable liquid motor fuel, shall be increased 100 percent when stored in approved storage cabinets, gas cabinets, exhausted enclosures or listed safety cans. Listed safety cans shall be in accordance with Section 2705.1.10 of the *New York City Fire Code*. Where Note d also applies, the increase for both notes shall be applied accumulatively.
- NYC** f. Quantities shall not be limited in a building protected throughout by a sprinkler system.
- NYC** g. Allowed only in buildings protected throughout by a sprinkler system.
- NYC** h. Containing not more than the maximum allowable quantity per control area of Class IA, Class IB or Class IC flammable liquids.
- NYC** i. Stationary fuel oil storage tanks shall comply with the requirements of the *New York City Construction Codes*, including the *New York City Mechanical Code*.
- NYC** j. Quantities shown in the table in parentheses have the units shown in parentheses at the head of the column.
- NYC** k. A maximum quantity of 200 pounds of solid or 20 gallons of liquid Class 3 oxidizers is allowed when such materials are necessary for maintenance and operation of equipment when the storage containers and the manner of storage are approved.
- NYC** l. Reserved.
- ⇒ m. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 2703.1.2 of the *New York City Fire Code*.
- NYC** n. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with the requirements of Section 2703.11 of the *New York City Fire Code*, see Table 2703.11.1 of the *New York City Fire Code*.
- NYC** o. For purposes of this table, gasoline and other flammable liquid motor fuels are classified as a Class IA flammable liquid.
- NYC** p. Unclassified detonable organic peroxides (see Chapter 39 of the *New York City Fire Code*), detonable pyrophoric materials (see Chapter 41 of the *New York City Fire Code*), detonable unstable (reactive) materials (see Chapter 43 of the *New York City Fire Code*) and detonable water-reactive materials (see Chapter 44 of the *New York City Fire Code*) shall be treated as explosives for purposes of storage, handling and use (see Chapter 33 of the *New York City Fire Code*).
- NYC** q. The maximum allowable quantities shall be limited by Section 2706 of the *New York City Fire Code* for non-production laboratories classified as Occupancy Group B.
- NYC** r. For storage of flammable and combustible liquids in Group M occupancy, see Chapter 34 of the *New York City Fire Code*.
- ⇒ s. Densely-packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.

**TABLE 307.1(2)**  
**MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIAL POSING A HEALTH HAZARD<sup>a, b, c, i, j</sup>**

MATERIAL	STORAGE <sup>d</sup>			USE-CLOSED SYSTEMS <sup>d</sup>			USE-OPEN SYSTEMS <sup>d</sup>		NYC NYC
	Solid pounds	Liquid gallons (pounds) <sup>e, f</sup>	Gas SCF <sup>g</sup> (pounds)	Solid pounds <sup>e</sup>	Liquid gallons (pounds) <sup>e</sup>	Gas SCF <sup>g</sup> (pounds)	Solid pounds <sup>e</sup>	Liquid gallons (pounds) <sup>e</sup>	
Corrosive	5,000	500	Gaseous 810 <sup>f</sup> Liquefied (150) <sup>h</sup>	5,000	500	Gaseous 810 <sup>f</sup> Liquefied (150) <sup>h</sup>	1,000	100	
Highly toxic	10	(10) <sup>h</sup>	Gaseous 20 <sup>g</sup> Liquefied (4) <sup>g, h</sup>	10	(10) <sup>h</sup>	Gaseous 20 <sup>g</sup> Liquefied (4) <sup>g, h</sup>	3	(3) <sup>h</sup>	NYC
Toxic	500	(500) <sup>h</sup>	Gaseous 810 <sup>f</sup> Liquefied (150) <sup>f, h</sup>	500	(500) <sup>h</sup>	Gaseous 810 <sup>f</sup> Liquefied (150) <sup>f, h</sup>	125	(125) <sup>h</sup>	NYC

For SI: 1 cubic foot = 0.028 m<sup>3</sup>, 1 pound = 0.454 kg, 1 gallon = 3.785 L.

a. For use of control areas, see Section 414.2.

b. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs, consumer or industrial products, and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.

c. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with the *New York City Fire Code*.

d. The aggregate quantity in storage, handling and use shall not exceed the quantity listed for storage.

e. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1. Where Note f also applies, the increase for both notes shall be applied accumulatively.

f. Maximum allowable quantities may be increased 100 percent when stored in approved storage cabinets, gas cabinets or exhausted enclosures as specified in the *New York City Fire Code*. Where Note e also applies, the increase for both notes shall be applied accumulatively.

g. Allowed only when stored in approved exhausted gas cabinets or exhausted enclosures as specified in the *New York City Fire Code*.

h. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.

i. For gallons of liquids, divide the amount in pounds by 10 in accordance with the *New York City Fire Code*.

j. The maximum allowable quantities shall be limited by Section 424 for chemical laboratories classified as Occupancy Group B and operating as nonproduction facilities for testing, research, experimental, instructional or education purposes.

**307.2 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

**AEROSOL.** A product that is dispensed from an aerosol container by a propellant, classified as follows.

**Level 1.** Aerosol products with a total chemical heat of combustion that is greater than 0 and less than or equal to 8,600 British thermal units per pound (Btu/lb) (20 kJ/g).

**Level 2.** Aerosol products with a total chemical heat of combustion that is greater than 8,600 Btu/lb (20 kJ/g), but less than or equal to 13,000 Btu/lb (30 kJ/g).

**Level 3.** Aerosol products with a total chemical heat combustion that is greater than 13,000 Btu/lb (30 kJ/g).

**BALED COTTON.** A natural seed fiber wrapped in and secured with industry accepted materials, typically consisting of burlap, woven polypropylene, polyethylene or cotton or sheet polyethylene, secured with wire or bands. The term baled cotton includes lint removed from the cottonseed (linters) and residual materials from the ginning process (motes).

**BALED COTTON, DENSELY PACKED.** Baled cotton with a packing density of at least 22 pounds per cubic foot (360 kg/m<sup>3</sup>). A bale of densely-packed baled cotton typically measures 55 inches (1397 mm) in length, 21 inches (533.4 mm) in width, and 27.6 to 35.4 inches (701 to 899 mm) in height.

**BARRICADE.** A structure or other artificial or natural barrier constructed in connection with the storage, handling and use of explosives that is designed to withstand the rapid release of energy in an explosion and provides a shield from the impact of such explosion. A straight line from the top of any sidewall of a building containing explosives to the eave-line of any magazine or other building or to a point 12 feet (3658 mm) above the center of a railway or highway shall pass through such barrier.

**Artificial barricade.** An artificial mound or revetment, including a barrier constructed of sandbags, with a minimum thickness of 3 feet (914 mm).

**Natural barricade.** Terrain or other natural features of the ground.

**BOILING POINT.** The temperature at which the vapor pressure of a liquid equals the atmospheric pressure of 14.7 pounds per square inch (psi) (101 kPa) gage or 760 mm of mercury. Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for the purposes of this classification, the 20-percent evaporated point of a distillation performed in accordance with ASTM D 86 shall be used as the boiling point of the liquid.

**CLOSED SYSTEM.** The use of any compressed gas and the use of a solid or liquid hazardous material in equipment or a vessel or system that remains closed during normal operations, such that vapors emitted during the operation of such

NYC equipment, vessel or system are not liberated outside of the  
 NYC equipment, vessel or system and the gas or hazardous mater-  
 NYC rial is not exposed to the atmosphere during such operation.  
 NYC Examples of closed systems include hazardous materials  
 NYC conveyed through a piping system into closed equipment or a  
 NYC closed vessel or system.

NYC **COMBUSTIBLE DUST.** Finely divided solid material that  
 NYC is 420 microns or less in diameter, will pass through a U.S.  
 NYC standard No. 40 sieve and, when dispersed in air in insuffi-  
 NYC cient concentrations, can be ignited by a flame, spark or  
 NYC other source of ignition.

NYC **COMBUSTIBLE FIBERS.** Readily ignitable and free-  
 NYC burning materials in fibrous or shredded form, such as cocoa  
 NYC fiber, cotton, excelsior, hay, hemp, henequen, istle, jute,  
 NYC kapok, oakum, sisal, Spanish moss, straw, tow, wastepaper  
 NYC or other natural or synthetic fibers that possess similar quali-  
 NYC ties, but excluding densely packed baled cotton.

NYC **Exception:** Moss used for medicinal purposes.

NYC **COMBUSTIBLE LIQUID.** For the purposes of transporta-  
 NYC tion, a combustible liquid as defined in the regulations of the  
 NYC United States Department of Transportation, as set forth in  
 NYC 49 CFR 173.120. For all other purposes, a liquid, other than a  
 NYC compressed gas or cryogenic fluid, having a closed cup flash  
 NYC point at or above 100°F (38°C) classified as follows:

**Class II.** Liquids having a closed cup flash point at or  
 above 100°F (38°C) and below 140°F (60°C).

**Class IIIA.** Liquids having a closed cup flash point at or  
 above 140°F (60°C) and below 200°F (93°C).

NYC **Class IIIB.** Liquids having a closed cup flash point at or  
 above 200°F (93°C).

NYC **COMPRESSED GAS.** A material, or mixture of materials  
 NYC which:‡

1. Is a gas at 68°F (20°C) or less at 14.7 psia (101 kPa) of pressure; and
2. Has a boiling point of 68°F (20°C) or less at 14.7 psia (101 kPa) that is either liquefied, nonliquefied or in solution at that temperature and pressure, except those gases which have no other health- or physical-hazard properties are not considered to be compressed until the pressure in the packaging exceeds 41 psia (28 kPa) at 68°F (20°C).

NYC The states of compressed gases are categorized as follows:

NYC **Nonliquefied compressed gases.** Gases, other than those  
 NYC in solution, which are in a packaging under the charged  
 NYC pressure and are entirely gaseous at a temperature of 68°F  
 NYC (20°C).

NYC **Liquefied compressed gases.** Gases that, in a packaging  
 NYC under the charged pressure, are partially liquid at a tem-  
 NYC perature of 68°F (20°C).

NYC **Compressed gases in solution.** Nonliquefied gases that  
 NYC are dissolved in a solvent.

NYC **Compressed gas mixtures.** A mixture of two or more  
 NYC compressed gases contained in a single packaging, the  
 NYC hazard properties of which are represented by the proper-  
 NYC ties of the mixture as a whole.

**CONTROL AREA.** Spaces within a building where quanti-  
 ties of hazardous materials not exceeding the maximum  
 allowable quantities per control area are stored, handled, or  
 used, including any dispensing. See also definition of “Out-  
 door control area” in the *New York City Fire Code*.

**CORROSIVE MATERIAL.** A material that causes full  
 thickness destruction of human skin at the site of contact  
 within a specified period of time when tested by methods set  
 forth in DOTn regulations 49 CFR 173.136 and 173.137, or a  
 liquid that has a severe corrosion rate on steel or aluminum  
 based on the criteria set forth in DOTn regulations 49 CFR  
 173.173(c)(2).

**CRYOGENIC FLUID.** A liquid having a boiling point  
 lower than -130°F (-89.9°C) at 14.7 pounds per square inch  
 absolute (psia) (an absolute pressure of 101.3 kPa).

**DAY BOX.** A portable magazine designed to hold explosive  
 materials constructed in accordance with the requirements for  
 a Type 3 magazine as defined and classified in Chapter 33 of  
 the *New York City Fire Code*.

**DEFLAGRATION.** An exothermic reaction, such as the  
 extremely rapid oxidation of a flammable dust or vapor in  
 air, in which the reaction progresses through the unburned  
 material at a rate less than the velocity of sound. A deflagra-  
 tion can have an explosive effect.

**DETONATION.** An exothermic reaction with explosive  
 effect that utilizes shock compression as the principal heating  
 mechanism and generates a shock wave in the material that  
 establishes and maintains a reaction that progresses through  
 the material at a rate greater than the velocity of sound.

**DISPENSING.** The pouring or transferring by other means  
 of any material from a container, tank or similar vessel,  
 which would release dusts, fumes, mists, vapors, or gases to  
 the atmosphere, unless such release is prevented by a device,  
 equipment or system designed for that purpose.

**EXPLOSION.** An effect produced by the sudden violent  
 expansion of gases, whether or not accompanied by a shock  
 wave or disruption, of enclosing materials, including the  
 effects of the following sources of explosion:

1. Chemical changes such as rapid oxidation, deflagration or detonation, decomposition of molecules and run-away polymerization (usually detonations).
2. Physical changes such as pressure tank ruptures.
3. Atomic changes (nuclear fission or fusion).

**EXPLOSIVE.** Any chemical compound, mixture or device,  
 the primary or common purpose of which is to function by  
 explosion. The term includes, but is not limited to, dynamite,  
 black powder, pellet powder, initiating explosives, detona-  
 tors, safety fuses, squibs, detonating cord, igniter cord, and  
 igniters.

The term “explosive” includes any material determined to  
 be within the scope of Chapter 40 of Title 18 of the United  
 States Code and any material classified as an explosive by the  
 hazardous materials regulations of the United States Depart-  
 ment of Transportation, as set forth in 49 CFR 173.52, except  
 fireworks. Explosives are classified in accordance with the

NYC following United States Department of Transportation classification and other terms in common usage.

**United States Department of Transportation Class 1 explosives.**

**Division 1.1.** Explosives that have a mass explosion hazard.

**Division 1.2.** Explosives that have a projection hazard but not a mass explosion hazard.

**Division 1.3.** Explosives that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but not a mass explosion hazard.

**Division 1.4.** Explosives that pose a minor explosion hazard. The explosive effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. Such explosives are not subject to mass explosion when exposed to fire.

**Division 1.5.** Explosives that present a mass explosion hazard, but which are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

**Division 1.6.** Explosives consisting of extremely insensitive articles that do not present a mass explosion hazard, and present a negligible probability of accidental initiation or propagation.

**High explosive.** Explosives, including dynamite, that, when detonated, are characterized by a high rate of reaction, high pressure development, and the presence of a detonation wave, and that can be caused to detonate by means of a No. 8 test blasting cap, when unconfined.

**Low explosive.** Explosives that will burn or deflagrate when ignited, and which are characterized by a rate of reaction that is less than the speed of sound, and low pressure development. Examples of low explosives include black powder, igniter cords, igniters, safety fuses, small arms ammunition and primers, and propellants, 1.3C.

**Mass-detonating explosives.** Division 1.1, 1.2 and 1.5 explosives that, whether individually or in combination, or loaded into ammunition or containers, explode virtually instantaneously when a small portion is subjected to fire, concussion, impact, the impulse of an initiating agent, or the effect of a considerable discharge of energy from without, with severe explosive effect, including the potential for structural damage to adjacent objects, and explosive propagation to other explosives stored in proximity, such that two or more quantities in proximity must be considered as one for quantity-distance purposes.

**FIREWORKS.** Any article or device that does not present a mass explosion hazard, that is manufactured or used to produce a visible or audible effect for entertainment or other display purposes by combustion, deflagration or detonation that meets the definition of 1.4G fireworks or 1.3G fireworks as set forth herein.

**Fireworks, 1.3G.** Large fireworks devices, classified as UN0335 by the United States Department of Transportation regulations, intended for use in fireworks displays

and designed to produce audible or visible effects by combustion, deflagration or detonation including firecrackers containing more than 130 milligrams (2 grains) of explosive composition, aerial shells containing more than 40 grams of pyrotechnic material, and other display pieces which exceed the limits for classification as 1.4G fireworks.

**Fireworks, 1.4G.** Small fireworks devices, classified as UN 0336 by United States Department of Transportation regulations, containing restricted amounts of pyrotechnic materials designed primarily to produce visible or audible effects by combustion.

**FLAMMABLE GAS.** A material which has a boiling point and becomes a gas at 68°F (20°C) or less at 14.7 pounds per square inch absolute (psia) (101 kPa) of pressure which:

1. Is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air, in accordance with testing procedures set forth in ASTM E 681; or
2. Has a flammable range at 14.7 psia (101 kPa) with air of at least 12 percent, regardless of the lower explosive limit, in accordance with testing procedures set forth in ASTM E 681.

The limits specified shall be determined at 14.7 psia (101 kPa) of pressure and a temperature of 68°F (20°C) in accordance with ASTM E 681.

**FLAMMABLE LIQUEFIED GAS.** A liquefied compressed gas which, under a charged pressure, is partially liquid at a temperature of 68°F (20°C) and which is flammable.

**FLAMMABLE LIQUID.** For the purposes of transportation, a flammable liquid as defined in the regulations of the United States Department of Transportation, as set forth in 49 CFR 173.120. For all other purposes, a liquid, other than a compressed gas or cryogenic fluid, having a closed cup flash point below 100°F (38°C) classified as follows:

**Class IA.** Liquids having a flash point below 73°F (23°C) and a boiling point below 100°F (38°C).

**Class IB.** Liquids having a flash point below 73°F (23°C) and a boiling point at or above 100°F (38°C).

**Class IC.** Liquids having a flash point at or above 73°F (23°C) and below 100°F (38°C).

**FLAMMABLE MATERIAL.** A material capable of being readily ignited from common sources of heat or at a temperature of 600°F (316°C) or less.

**FLAMMABLE SOLID.** A solid, other than a blasting agent or other explosive, whether in elemental or alloy form, that is capable of causing fire through friction, absorption or moisture, spontaneous chemical change, or heat retained from manufacturing or processing, or which has an ignition temperature below 212°F (100°C) or which burns so vigorously and persistently when ignited as to create a serious hazard. A chemical shall be considered a flammable solid if upon testing using the method prescribed in CPSC regulations, as set forth in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than 0.1 inch (2.5 mm) per second along its major axis.



**FLASH POINT.** The minimum temperature in degrees Fahrenheit at which a liquid will give off sufficient vapors to form an ignitable mixture with air near the surface or in the container, but will not sustain combustion. The flash point of a liquid shall be determined by appropriate test procedure and apparatus as specified in ASTM D 56, ASTM D 93 or ASTM D 3278.

**HANDLING.** The movement of a material in its container, the removal of the material from its container, or any other action or process that may affect the material, other than its storage or use.

**HAZARDOUS MATERIALS.** Those chemicals or substances that are physical hazards or health hazards as defined and classified in this section and the *New York City Fire Code*, whether the materials are in usable or waste condition.

**HEALTH HAZARD.** A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. The term "health hazard" includes chemicals that are toxic or highly toxic, and corrosive.

**HIGHLY TOXIC MATERIAL.** A chemical that is lethal at the following doses or concentrations:

1. A chemical that has a median lethal dose ( $LD_{50}$ ) of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each; or
2. A chemical that has a median lethal dose ( $LD_{50}$ ) of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each; or
3. A chemical that has a median lethal concentration ( $LC_{50}$ ) in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

**INCOMPATIBLE MATERIALS.** Materials that, if mixed or combined, could explode, generate heat, gases or other by products, or react in such a way hazardous to life or property.

**INERT GAS.** A gas that is capable of reacting with other materials only under abnormal conditions such as high temperatures, pressures and similar extrinsic physical forces. Within the context of the code, inert gases do not exhibit either physical or health properties as defined (other than acting as a simple asphyxiant) or hazard properties other than those of a compressed gas. Some of the more common inert gases include argon, helium, krypton, neon, nitrogen and xenon.

**OPEN SYSTEM.** The use of a solid or liquid hazardous material in equipment or a vessel or system that remains open during normal operation such that vapors are emitted during the operation of such equipment, vessel or system and the material is exposed to the atmosphere during such operation. Examples of open systems for solids and liquids include

dispensing from or into open beakers or containers, dip tank and plating tank operations.

**ORGANIC PEROXIDE.** An organic compound having a double oxygen or peroxy (-O-O-) in its chemical structure. Organic peroxides can present an explosion hazard (detonation or deflagration), can be shock sensitive, or can be susceptible to decomposition into various unstable compounds over an extended period of time and are classified as follows based upon their hazardous properties:

**Class I.** Organic peroxides that are capable of deflagration but not detonation.

**Class II.** Organic peroxides that burn very rapidly and that pose a moderate reactivity hazard.

**Class III.** Organic peroxides that burn rapidly and that pose a moderate reactivity hazard.

**Class IV.** Organic peroxides that burn in the same manner as ordinary combustibles and that pose a minimal reactivity hazard.

**Class V.** Organic peroxides that burn with less intensity than ordinary combustibles or do not sustain combustion and that pose no reactivity hazard.

**Unclassified detonable.** Organic peroxides that are capable of detonation and pose an extremely high explosion hazard through rapid explosive decomposition.

**OXIDIZER.** A material that readily yields oxygen or other oxidizing gas or that readily reacts to promote or initiate combustion of combustible materials, and if heated or contaminated can result in vigorous self-sustained decomposition, classified as follows:

**Class 1.** An oxidizer that causes a readily measurable increase in the burning rate of combustible materials with which it comes in contact, but less than a moderate increase.

**Class 2.** An oxidizer that causes a moderate increase in the burning rate of combustible materials with which it comes in contact.

**Class 3.** An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes in contact.

**Class 4.** An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock and causes a severe increase in the burning rate of combustible materials with which it comes into contact.

**OXIDIZING GAS.** A gas that can support and accelerate combustion of other materials more than air does.

**PHYSICAL HAZARD.** A chemical for which there is evidence that it is a combustible liquid, compressed gas, cryogenic, explosive, flammable gas, flammable liquid, flammable solid, organic peroxide, oxidizer, pyrophoric or unstable (reactive) or water-reactive material.

**PYROPHORIC MATERIAL.** A material with an autoignition temperature in air, at or below a temperature of 130°F (54°C).



**NYC PYROTECHNIC MATERIAL.** A chemical mixture consisting predominantly of solids that, upon ignition, are capable of producing a controlled, self-sustaining, and self-contained exothermic reaction, that functions without external oxygen, resulting in a visible or audible effect by combustion, deflagration, or detonation.

**NYC STANDARD CUBIC FEET (SCF).** Cubic feet of gas at normal temperature and pressure (NTP).

**NYC TOXIC MATERIAL.** A chemical that is lethal at the following doses or concentrations:

- NYC** 1. A chemical that has a median lethal dose ( $LD_{50}$ ) of more than 50 milligrams per kilogram, but not more than 500 milligrams per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each; or
- NYC** 2. A chemical that has a median lethal dose ( $LD_{50}$ ) of more than 200 milligrams per kilogram but not more than 1,000 milligrams per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between 2 and 3 kilograms each; or
- NYC** 3. A chemical that has a median lethal concentration ( $LC_{50}$ ) in air of more than 200 parts per million but not more than 2,000 parts per million by volume of gas or vapor, or more than 2 milligrams per liter but not more than 20 milligrams per liter of mist, fume or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 200 and 300 grams each.

**NYC Exception:** For purposes of this code, chlorine shall be classified as a highly toxic material.

**NYC UNSTABLE (REACTIVE) MATERIAL.** A material, other than an explosive, which in the pure state or as commercially produced, will vigorously polymerize, decompose, condense or become self-reactive and undergo other violent chemical changes, including explosion, when exposed to heat, friction or shock, or in the absence of an inhibitor, or in the presence of contaminants, or in contact with incompatible materials.

**NYC** Unstable (reactive) materials‡ shall be classified as follows:

**Class 1.** Materials that in themselves are normally stable but which can become unstable at elevated temperatures and pressure.

**Class 2.** Materials that in themselves are normally unstable and readily undergo violent chemical change but do not detonate. This class includes materials that can undergo chemical change with rapid release of energy at normal temperatures and pressures, and that can undergo violent chemical change at elevated temperatures and pressures.

**Class 3.** Materials that in themselves are capable of detonation or of explosive decomposition or explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. This class includes materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

**Class 4.** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. This class includes materials that are sensitive to mechanical or localized thermal shock at normal temperatures and pressures.

**WATER-REACTIVE MATERIAL.** A material that explodes; violently reacts; produces flammable, toxic or other hazardous gases; or generates enough heat to cause auto-ignition or ignition of combustible materials upon exposure to water or moisture. Water-reactive materials are classified as follows:

**Class 1.** Materials that may react with water with some release of energy, but not violently. **NYC**

**Class 2.** Materials that react violently with water or cause water to boil upon contact; produce flammable, toxic or other hazardous gases upon contact with water; or upon contact with water generate sufficient heat to cause auto-ignition of adjoining combustible materials. **NYC**

**Class 3.** Materials that react explosively with water without requiring heat or confinement.

**307.3 High-hazard‡ Group H-1.** Buildings and structures containing materials that present a detonation hazard shall be classified as Group H-1. Such materials shall include, but not be limited to, the following: **NYC**

Detonable pyrophoric materials

Explosives:

- Division 1.1
- Division 1.2
- Division 1.3

**Exception:** Materials that are used and maintained in a form where either confinement or configuration will not elevate the hazard from a mass fire to mass explosion hazard shall be allowed in H-2 occupancies.

Division 1.4

**Exception:** Articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco and Firearms regulations, or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles shall be allowed in H-3 occupancies.

Division 1.5

Division 1.6

Organic peroxides, unclassified detonable

Oxidizers, Class 4

Unstable (reactive) materials, Class 3 detonable and Class 4

Pyrophoric materials, detonable

Water-reactive materials, Class 2 and 3, detonable

No part of this section shall be construed to authorize the manufacture, storage, sale or use of explosives, including fireworks, if otherwise prohibited by the *New York City Fire Code* and unless in compliance with the requirements of the *New York City Fire Code*.

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**NYC** **307.4 High-hazard† Group H-2.** Buildings and structures containing materials that present a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA flammable or combustible liquids which are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 psi (103.4 kPa) gage.

Combustible dusts

Cryogenic fluids, flammable

Flammable gases

Organic peroxides, Class I

Oxidizers, Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 psi (103.3 kPa) gage.

Pyrophoric liquids, solids and gases, nondetonable

Unstable (reactive) materials, Class 3, nondetonable

**NYC** Water-reactive materials, Class 3, nondetonable

**NYC** No part of this section shall be construed to authorize an  
**NYC** LPG-distribution facility if otherwise prohibited by the *New York City Fire Code*.

**NYC** **307.5 High-hazard† Group H-3.** Buildings and structures containing materials that readily support combustion or present a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:

**NYC** Class I, II or IIIA flammable or combustible liquids which are used or stored in normally closed containers or systems pressurized at less than 15 psi (103 kPa) gage.

**NYC** Combustible fibers

⇒ Cryogenic fluids, oxidizing

Flammable solids

**NYC** Organic peroxides, Classes II and III

**NYC** Oxidizers, Classes 1 and 2

⇒ Oxidizing gases

Unstable (reactive) materials, Class 2

**NYC** Water-reactive materials, Class 2, nondetonable

**NYC** **307.6 High-hazard† Group H-4.** Buildings and structures containing materials that are health hazards shall be classified as Group H-4. Such materials shall include, but not be limited to, the following:

Corrosives

Highly toxic materials

Toxic materials

**NYC** **307.7 Group H-5 structures.** Semiconductor fabrication facilities and comparable research and development areas in which hazardous production materials (HPM) are used and the aggregate quantity of materials is in excess of those listed in Tables 307.1(1) and 307.1(2). Such facilities and areas shall be designed and constructed in accordance with Section 415.8.

➔ **307.8 Multiple hazards.** Buildings and structures containing a material or materials representing hazards that are classified in one or more of Groups H-1, H-2, H-3 and H-4 shall conform to the code requirements for each of the occupancies so classified.

## SECTION BC 308 INSTITUTIONAL GROUP I

**308.1 Institutional Group I.** Institutional Group I occupancy includes, among others, the use of a building or structure, or a portion thereof, in which people are cared for or live in a supervised environment, having physical limitations because of health or age are harbored for medical treatment or other care or treatment, or in which people are detained for penal or correctional purposes or in which the liberty of the occupants is restricted. Institutional occupancies shall be classified as Group I-1, I-2, I-3 or I-4.

**308.1.1 Definitions.** For definitions of terms related to Group I occupancy classification, see Section 310.2. **NYC**

**308.2 Group I-1.** This occupancy shall include buildings, structures or parts thereof housing persons, on a 24-hour basis, who because of age, mental disability or other reasons, live in a supervised residential environment that provides personal care services. The occupants are capable of self-preservation and capable of responding to an emergency situation without physical assistance from staff. Such occupancy shall be subject to the *New York State Multiple Dwelling Law*. This group shall include, but not be limited to, the following: **NYC**

Adult homes, where occupants are capable of self-preservation (see Section 308.2.1) **NYC**

Alcohol and drug abuse rehabilitation centers **NYC**

Assisted living facilities **NYC**

Community residences or intermediate-care facilities (see Section 308.2.2) **NYC**

Congregate care facilities

Convalescent facilities ⇐

Enriched housing, where occupants are capable of self-preservation (see Section 308.2.1) **NYC**

Halfway houses

Overnight facilities for children where all supervised occupants are under the age of 18, with no more than two children under the age of 2 **NYC**

Residential care facilities **NYC**

Social rehabilitation facilities

**308.2.1 Adult homes and enriched housing.** Adult homes and enriched housing facilities operated pursuant to and meeting the additional construction requirements of Section 460 of the *New York State Social Services Law* and regulations of the New York State Department of Health offering care on a 24-hour basis to persons capable of self-preservation, in the same building, shall be classified as Group I-1. **NYC**

**Exception:** Such a facility offering supervised care on a 24-hour basis for no more than 16 occupants capable of self-preservation, in the same building, may be classified in Group R in accordance with Section 310. **NYC**

**308.2.2 Community residences or intermediate-care facilities.** Community residences or intermediate-care facilities, operated pursuant to and meeting the additional construction requirements of the *New York State Mental Hygiene Law* and applicable regulations of the New York State Office of Mental Health and Office for People with **NYC**

Developmental Disabilities shall be classified as Group I-1.

**Exceptions:** Such facilities limited to 14 residents capable of self-preservation and three staff members per dwelling unit shall be classified as:

1. Group R-1, where such facility does not occupy more than two dwelling units in a residential building classified as R-1 of Type I or II construction, or one dwelling unit in any other type of construction, and occupied on a transient basis; or
2. Group R-2 where such facility does not occupy more than two dwelling units in a residential building classified R-2 of Type I or II construction, or one dwelling unit in any other type of construction, and occupied on a long-term basis; or
3. Group R-3 where the number of dwelling units in the building does not exceed two.

**308.3 Group I-2.** This occupancy shall include buildings and structures used for medical, surgical, psychiatric, nursing or personal care on a 24-hour basis or overnight of more than two children under the age of 2, or more than three persons who are not capable of self-preservation and not capable of responding to an emergency situation without physical assistance from staff. This group shall include, but not be limited to, the following:

Adult homes, where occupants are not capable of self-preservation, operated pursuant to and meeting the additional construction requirements of Section 460 of the *New York State Social Services Law* and regulations of the New York State Department of Health

Child care facilities

Community residences or intermediate-care facilities, where occupants are not capable of self-preservation, operated pursuant to and meeting the additional construction requirements of the *New York State Mental Hygiene Law* and applicable regulations of the New York State Office of Mental Health and Office for People with Developmental Disabilities

Enriched Housing, where occupants are not capable of self-preservation, operated pursuant to and meeting the additional construction requirements of Section 460 of the *New York State Social Services Law* and regulations of the New York State Department of Health

Hospitals

Nursing homes

Mental hospitals where patients are not under restraint

Detoxification facilities

**Exception:** Such a facility offering care on a 24-hour basis for three or fewer persons who are not capable of self-preservation may occupy not more than one dwelling unit in a Group R occupancy.

**308.3.1 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

**CHILD CARE FACILITIES.** Facilities that provide care on a 24-hour basis to more than five children, under the age of 2.

**DETOXIFICATION FACILITIES.** Facilities that serve patients who are provided treatment for substance abuse on a 24-hour basis and who are incapable of self-preservation or who are harmful to themselves or others.

**HOSPITALS AND MENTAL HOSPITALS.** Buildings or portions thereof used on a 24-hour basis for the medical, psychiatric, obstetrical or surgical treatment of inpatients who are incapable of self-preservation.

**NURSING HOMES.** Nursing homes are long-term care facilities on a 24-hour basis, including both intermediate care facilities and skilled nursing facilities, serving more than five persons and any of the persons are incapable of self-preservation.

**308.4 Group I-3.** This occupancy shall include buildings and structures that are inhabited by more than five persons who are under restraint or security. An I-3 facility is occupied by persons who are generally incapable of self-preservation due to security measures not under the occupants' control. This group shall include, but not be limited to, the following:

Correctional centers

Detention centers

Jails

Mental hospitals where patients are under restraint

Prerelease centers

Prisons

Reformatories

Buildings of Group I-3 shall be classified as one of the occupancy conditions indicated in Section 408.1.

**308.5 Group I-4.** This group shall include custodial care facilities providing care to more than two children under the age of 2, or to more than four persons over the age of 2 who are not capable of responding to an emergency situation without physical assistance from the staff. Such occupancy shall include, but not be limited to, adult custodial care facilities and day nurseries.

**Exceptions:**

1. Custodial care facility as described in Section 303.
2. Custodial care facility as described in Section 304.
3. Custodial care facility as described in Exception 3 of Section 305.1.
4. Such facility providing care within a dwelling unit as described in Section 310.
5. Such facility providing care to children under the age of 2 in religious houses of worship during religious functions.

## SECTION BC 309 MERCANTILE GROUP M

**309.1 Mercantile Group M.** Mercantile Group M occupancy includes, among others, the use of a building or structure or a portion thereof, for the display and sale of merchandise, and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the



public. Mercantile occupancies shall include, but not be limited to, the following:

- Department stores
- Drug stores
- Markets
- Motor fuel-dispensing facilities
- Retail or wholesale stores
- Sales rooms

**309.2 Quantity of hazardous materials.** The aggregate quantity of nonflammable solid and nonflammable or non-combustible liquid hazardous materials stored or displayed in a single control area of a Group M occupancy shall not exceed the quantities in Table 414.2.5(1).

## SECTION BC† 310 RESIDENTIAL GROUP R

**310.1 Residential Group R.** Residential Group R includes, among others, the use of a building or structure, or a portion thereof, for dwelling or sleeping purposes when not classified as Institutional Group I. Buildings containing three or more dwelling units shall be subject to the *New York State Multiple Dwelling Law*. Residential occupancies shall be classified as Group R-1, R-2, or R-3.

**310.1.1 Group R-1.** This occupancy shall include:

1. Residential buildings or spaces occupied, as a rule, transiently, for a period less than one month, as the more or less temporary abode of individuals or families who are lodged with or without meals, including, but not limited to, the following:

Class B multiple dwellings as defined in Section 27-2004 of the *New York City Housing Maintenance Code* and Section 4 of the *New York State Multiple Dwelling Law*, where not classified in Group I-1.

Club houses

Hotels (transient)

Motels (transient)

Rooming houses (boarding houses—transient)

Settlement houses

Vacation timeshares

2. College or school student dormitories, except for student apartments classified as an R-2 occupancy.
3. Congregate living units owned and operated by a government agency or not-for-profit organization, where the number of occupants in the dwelling unit exceeds the limitations of a family as defined, including, but not limited to, the following:

Adult homes or enriched housing with 16 or fewer occupants requiring supervised care within the same building on a 24-hour basis

Fraternity and sorority houses

Homeless shelters

**310.1.2 Group R-2.** This occupancy shall include buildings or portions thereof containing sleeping units or more

than two dwelling units that are occupied for permanent resident purposes as defined in subparagraph (a) of paragraph eight of subdivision a of Section 27-2004 of the *New York City Housing Maintenance Code*. Such occupancy shall be subject to the *New York State Multiple Dwelling Law*. This group shall include, but not be limited to, the following:

Adult homes or enriched housing with 16 or fewer

occupants requiring supervised care on a 24-hour basis in the same building, provided that the number of occupants per dwelling unit does not exceed the definition of a family

Apartment houses

Apartment hotels (nontransient)

Class A multiple dwellings as defined in Section 27-2004 of the *New York City Housing Maintenance Code* and Section 4 of the *New York State Multiple Dwelling Law*, where not classified in Group I-1:

1. Dwelling units where the resident of the unit provides custodial care to no more than four persons on less than a 24-hour basis and not overnight, where not classified in Group I-1.
2. Dwelling units where the resident of the unit provides child custodial care as a family day care home registered with the New York City Department of Health and Mental Hygiene in accordance with the *New York State Social Services Law* with no more than six children between the ages of 2 and 13, or with no more than five children if any are under the age of 2, receiving supervised care on less than a 24-hour basis and not overnight, where not classified in Group I-1.

Convents and monasteries with more than 20 occupants in the building

Student apartments

**310.1.3 Group R-3.** This occupancy shall include buildings or portions thereof containing no more than 2 dwelling units, occupied, as a rule, for shelter and sleeping accommodation on a long-term basis for a month or more at a time, and are not classified in Group R-1, R-2 or I. This group shall include, but not be limited to, the following:

Convents and monasteries with fewer than 20 occupants in the building

Group homes

One- and two-family dwellings, including the following:

1. Dwelling units where the resident of the unit provides custodial care to no more than four persons on less than a 24-hour basis and not overnight.
2. Dwelling units where the resident of the unit provides child custodial care as a family day care home registered with the New York City Department of Health and Mental Hygiene in accordance with the *New York State Social Services*

Law with no more than six children between the ages of 2 and 13, or with no more than five children if any are under the age of 2, receiving supervised care on less than a 24-hour basis and not overnight.

⇒ **310.2 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

**APARTMENT.** A dwelling unit providing permanent provisions for both sanitation and kitchen facilities, occupied or arranged to be occupied by not more than one family maintaining a common household.

**APARTMENT, STUDENT.** An apartment occupied or arranged to be occupied by students enrolled at a single accredited college or university and maintaining a common household pursuant to a lease, sublease, or occupancy agreement directly with such college or university.

**BOARDER (ROOMER, LODGER).** A person who pays a consideration for living within the household and does not occupy such space as an incident of employment.

⇒ **CONGREGATE LIVING UNIT.** A dwelling unit, comprised of one or more habitable rooms separated by nonrated partitions, occupied or arranged to be occupied by more than one family or by persons who are not maintaining a common household. Creation of or conversion to such unit shall be subject to Section 27-2077 of the *New York City Housing Maintenance Code*.

**CUSTODIAL CARE FACILITY.** A building or part thereof occupied by persons, on less than a 24-hour basis and not overnight, who because of age, disability or other reasons, receive personal care services by individuals other than parents or guardians, relatives by blood, marriage, domestic partnership, or adoption, in a place other than the home of the person cared for.

⇒ **DWELLING.** A building or structure which is occupied in whole or in part as the home, residence or sleeping place of one or more families.

**DWELLING, MULTIPLE.** A dwelling which is either rented, leased, let or hired out, to be occupied, or is occupied, as the residence or home of three or more families living independently of each other. A multiple dwelling does not include a building used for occupancies in Groups I-2, I-3 or I-4.

**DWELLING, ONE-FAMILY.** Any building or structure designed and occupied exclusively for residence purposes on a long-term basis for more than a month at a time by not more than one family. One-family dwellings shall also be deemed to include a dwelling located in a series of one-family dwellings each of which faces or is accessible to a legal street or public thoroughfare, provided that each such dwelling unit is equipped as a separate dwelling unit with all essential services, and also provided that each such unit is arranged so that it may be approved as a legal one-family dwelling.

**DWELLING, TWO-FAMILY.** Any building or structure designed and occupied exclusively for residence purposes on a long-term basis for more than a month at a time by not

more than two families. Two-family dwellings shall also be deemed to include a dwelling located in a series of two-family dwellings each of which faces or is accessible to a legal street or public thoroughfare, provided that each such dwelling is equipped as a separate dwelling with all essential services, and also provided that each such dwelling is arranged so that it may be approved as a legal two-family dwelling.

**DWELLING UNIT.** A single unit consisting of one or more habitable rooms and occupied or arranged to be occupied as a unit separate from all other units within a dwelling.

#### **FAMILY.**

1. A single person occupying a dwelling unit and maintaining a common household with not more than two boarders, roomers or lodgers; or
2. Two or more persons related by blood, adoption, legal guardianship, marriage or domestic partnership; occupying a dwelling unit and maintaining a common household with not more than two boarders, roomers or lodgers; or
3. Not more than three unrelated persons occupying a dwelling unit and maintaining a common household; or
4. Not more than three unrelated persons occupying a dwelling unit in a congregate housing or shared living arrangement and maintaining a common household; or
5. Members of a group home; or
6. Foster children placed in accordance with provisions of the *New York State Social Services Law*, their foster parent(s), and other persons related to the foster parents by blood, marriage or domestic partnership; where all residents occupy and maintain a common household with not more than two boarders, roomers or lodgers; or
7. Up to seven unrelated students enrolled at a single accredited college or university occupying a student apartment and maintaining a common household pursuant to a lease, sublease, or occupancy agreement directly with such college or university, provided that:
  - 7.1. The entire structure in which the dwelling unit is located is fully sprinklered in accordance with Chapter 9; and
  - 7.2. Such occupancy does not exceed the maximums contained in Section 27-2075(a) of the *New York City Housing Maintenance Code*; and
  - 7.3. Prior to commencement of such occupancy, and on an annual basis thereafter such college or university has submitted a fire safety plan containing fire safety and evacuation procedures for such dwelling unit that is acceptable to the fire commissioner and in compliance with any rules promulgated by the Fire Commissioner; and
  - 7.4. The dwelling unit complies with additional occupancy and construction requirements as may be established by rule by the Housing Preservation and Development Commissioner.



NYC A common household is deemed to exist if all household  
 NYC members have access to all parts of the dwelling unit. Lack of  
 NYC access to all parts of the dwelling unit establishes a rebuttable  
 NYC presumption that no common household exists.

NYC **GROUP HOME.** A facility for the care and maintenance of  
 NYC not fewer than seven nor more than 12 children, supervised  
 NYC by the New York State Board of Social Welfare, and oper-  
 NYC ated pursuant to and meeting any additional construction  
 NYC requirements of Section 374-C of the *New York State Social*  
 NYC *Services Law* and applicable regulations of the New York  
 NYC State Department of Social Services. Such a facility occu-  
 NYC pied by more than 12 children shall be classified as Group  
 NYC I-1.

**PERSONAL CARE SERVICE.** The care of residents who do not require chronic or convalescent medical or nursing care. Personal care involves responsibility for the safety of the resident while inside the building.

NYC **RESIDENTIAL CARE/ASSISTED LIVING FACILI-**  
 NYC **TIES.** A building or part thereof housing persons, on a 24-  
 NYC hour basis, who because of age, mental disability or other  
 NYC reasons, live in a supervised residential environment which  
 NYC provides personal care services. The occupants are capable  
 NYC of self-preservation and are capable of responding to an  
 NYC emergency situation without physical assistance from staff.  
 NYC This classification shall include, but not be limited to, the  
 NYC following: residential board and care facilities, assisted liv-  
 NYC ing facilities, halfway houses, congregate care facilities,  
 NYC social rehabilitation facilities, alcohol and drug abuse reha-  
 NYC bilitation centers and convalescent facilities.

NYC **ROOMING HOUSE.** A dwelling (i) which was originally  
 NYC erected as a single- or two-family private dwelling pursuant  
 NYC to the *New York City Building Code* in effect prior to Decem-  
 NYC ber 6, 1968, (ii) which is a "Class B converted dwelling" as  
 NYC such term is defined in the *New York City Housing Mainte-*  
 NYC *nance Code*, and (iii) which has more than half of its habit-  
 NYC able rooms as sleeping units. The creation of or conversion  
 NYC to a rooming house shall be limited by Section 27-2077 of  
 NYC the *New York City Housing Maintenance Code*.

NYC **SLEEPING UNIT.** A dwelling unit, which may contain  
 NYC either toilet or kitchen facilities but not both. Any sleeping  
 NYC unit housing more than one family shall also be classified as  
 NYC a congregate living unit. The creation of or conversion to  
 NYC sleeping units shall be limited by Section 27-2077 of the  
 NYC *New York City Housing Maintenance Code*.

**TRANSIENT.** Occupancy of a dwelling unit or sleeping unit for not more than 30 days.

## SECTION BC 311 STORAGE GROUP S

NYC **311.1 Storage Group S.** Storage Group S occupancy  
 NYC includes, among others, the use of a building or structure, or  
 NYC a portion thereof, for storage, such as for warehouses, stor-  
 NYC age rooms, freight depots and distribution centers, when not  
 NYC classified as a hazardous occupancy.

NYC **311.2 Moderate-hazard storage, Group S-1.** Buildings  
 NYC occupied for storing any flammable or combustible materials  
 NYC that are likely to permit the development and production of

fire with moderate rapidity including, but not limited to, NYC storage of the following:

Aerosols, Levels 2 and 3  
 Aircraft hangar (storage and repair) |  
 Bags; cloth, burlap and paper  
 Bamboos and rattan  
 Baskets  
 Belting; canvas and leather  
 Books and paper in rolls or packs  
 Boots and shoes  
 Buttons, including cloth covered, pearl or bone  
 Cardboard and cardboard boxes  
 Clothing, woolen wearing apparel  
 Cordage  
 Dry boat storage (indoor, not accessory to Group R) | NYC  
 Furniture  
 Furs  
 Glues, mucilage, pastes and size  
 Grains  
 Horns and combs, other than celluloid  
 Leather Linoleum Lumber Photo engravings  
 Resilient flooring Silks  
 Soaps Sugar Tires, bulk storage of  
 Tobacco, cigars, cigarettes and snuff  
 Upholstery and mattresses  
 Wax candles

**311.3 Low-hazard storage, Group S-2.** Includes, among others, buildings used for the storage of noncombustible materials such as products on wood pallets or in paper cartons with or without single thickness divisions; or in paper wrappings. Such products are permitted to have a negligible amount of plastic trim, such as knobs, handles or film wrapping. Group S-2 storage uses shall include, but not be limited to, storage of the following:

Asbestos  
 Beverages up to and including 16 percent alcohol in metal, |  
 glass or ceramic containers  
 Cement in bags  
 Chalk and crayons  
 Dairy products in nonwaxed coated paper containers  
 Dry cell batteries  
 Electrical coils  
 Electrical motors  
 Empty cans  
 Food products  
 Foods in noncombustible containers  
 Fresh fruits and vegetables in nonplastic trays or  
 containers  
 Frozen foods  
 Glass  
 Glass bottles, empty or filled with noncombustible liquids  
 Gypsum board  
 Inert pigments  
 Ivory  
 Meats  
 Metal cabinets  
 Metal desks with plastic tops and trim  
 Metal parts  
 Metals

Mirrors  
 Oil-filled and other types of distribution transformers  
 Parking garages, open or enclosed  
 Porcelain and pottery  
 Stoves  
 Talc and soapstones  
 Washers and dryers

## **SECTION BC 312** **UTILITY AND MISCELLANEOUS GROUP U**

**312.1 General.** Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:



Carports



Fences more than 6 feet (1829 mm) high

NYC

Private garages as per Section 406.1

Retaining walls

NYC

Sheds or greenhouses accessory to Group R-3

NYC

occupancies, that are freestanding, less than 120 square

NYC

feet (11.15 m<sup>2</sup>) in area, not permanently affixed to the

NYC

ground, and used for household goods or items

NYC

associated with the garden or lawn. Any other shed shall

NYC

be classified as either S-1 or S-2.



Tanks

Towers



## CHAPTER 4

# SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

### SECTION BC 401 SCOPE

**401.1 Detailed use and occupancy requirements.** In addition to the occupancy and construction requirements in this code, the provisions of this chapter apply to the special uses and occupancies described herein.

### SECTION BC 402 COVERED MALL AND OPEN MALL BUILDINGS

**402.1 Scope.** The provisions of this section shall apply to buildings or structures defined herein as covered mall buildings not exceeding three floor levels at any point nor more than three stories above grade plane. Except as specifically required by this section, covered mall buildings shall meet applicable provisions of this code.

#### Exceptions:

1. Foyers and lobbies of Groups B, R-1 and R-2 are not required to comply with this section.
2. Buildings need not comply with the provisions of this section where they fully comply with other applicable provisions of this code.

**402.1.1 Occupancy classification.** A mall in compliance with the provisions of this section shall be classified as occupancy group M.

**402.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**ANCHOR BUILDING.** An exterior perimeter building of a group other than H having direct access to a covered mall building but having required means of egress independent of the mall.

**COVERED MALL BUILDING.** A single building enclosing a number of tenants and occupants such as retail stores, drinking and dining establishments, entertainment and amusement facilities, passenger transportation terminals, offices, and other similar uses wherein two or more tenants have a main entrance into one or more malls. For the purpose of this chapter, anchor buildings shall not be considered as a part of the covered mall building. The term "covered mall building" shall include open mall buildings as defined below.

**Mall.** A roofed or covered common pedestrian area within a covered mall building that serves as access for two or more tenants and not to exceed three levels that are open to each other. The term "mall" shall include open malls as defined below.

**Open mall.** An unroofed common pedestrian way serving a number of tenants not exceeding three levels. Circulation

at levels above grade shall be permitted to include open exterior balconies leading to exits discharging at grade.

**Open mall building.** Several structures housing a number of tenants, such as retail stores, drinking and dining establishments, entertainment and amusement facilities, offices, and other similar uses, wherein two or more tenants have a main entrance into one or more open malls. For the purpose of Chapter 4, anchor buildings are not considered as a part of the open mall building.

**FOOD COURT.** A public seating area located in the mall that serves adjacent food preparation tenant spaces.

**GROSS LEASABLE AREA.** The total floor area designed for tenant occupancy and exclusive use. The area of tenant occupancy is measured from the centerlines of joint partitions to the outside of the tenant walls. All tenant areas, including areas used for storage, shall be included in calculating gross leasable area.

**402.3 Fire protection plan.** A fire protection plan shall be provided to the department and the Fire Department pursuant to Article 109 of Title 28.

**402.4 Means of egress.** The covered mall building shall be provided with means of egress as required by this code. Where there is a conflict between the requirements of this code and the requirements of this section, the requirements of this section shall apply.

**402.4.1 Occupant load.** The calculated occupant load used to determine the required number of means of egress shall be in accordance with this section.

**402.4.1.1 Occupant load of tenant spaces.** The occupant load permitted in any individual tenant space in a covered mall building shall be determined in accordance with Chapter 10. Means of egress requirements for individual tenant spaces shall be based on the occupant load thus determined.

**402.4.1.2 Occupant load of mall.** In determining required means of egress of the mall, the total occupant load in the mall shall include the occupant load attributed to the mall as determined by Section 402.4.1.2.1, plus the occupant load of the food court as determined by Section 402.4.1.2.3, if any.

**402.4.1.2.1 Occupant load formula.** To determine the occupant load attributed to the mall, the gross leasable area (square feet), excluding any food court and anchor buildings, shall be divided by the occupant load factor (*OLF*) value determined by Equation 4-1.

$$OLF = (0.00007)(GLA) + 25 \quad (\text{Equation 4-1})$$

where:

**OLF** = The occupant load factor (square feet per person).

**GLA** = The gross leasable area (square feet).

**Exception:** Tenant spaces attached to a covered mall building but with a means of egress system that is totally independent of the covered mall building shall not be considered as gross leasable area for determining the required means of egress for the covered mall building.

**402.4.1.2.2 OLF range.** The occupant load factor (**OLF**) is not required to be less than 30 and shall not exceed 50.

**402.4.1.2.3 Food courts.** The occupant load of a food court shall be determined in accordance with Section 1004 and shall be added to the occupant load of the mall.

**402.4.1.3 Anchor buildings.** The occupant load of anchor buildings opening into the mall shall not be included in computing the total number of occupants for the covered mall building.

**402.4.2 Number of means of egress.** The required number of means of egress shall be determined in accordance with this section.

**402.4.2.1 Number of means of egress within tenant spaces.** Wherever the distance of travel to the mall from any location within a tenant space used by persons other than employees exceeds 75 feet (22 860 mm) or the tenant space exceeds an occupant load of 50, no fewer than two means of egress shall be provided.

**402.4.2.2 Number of means of egress from the mall.** The number of means of egress from the mall shall be determined in accordance with Chapter 10 and shall be based upon an occupant load calculated in accordance with Section 402.4.1.2.

**402.4.3 Arrangements of means of egress.** Means of egress shall be arranged in accordance with this section.

**402.4.3.1 Anchor building means of egress.** Required means of egress for anchor buildings shall be provided independently from the mall means of egress system. The occupant load of anchor buildings opening into the mall shall not be included in determining means of egress requirements for the mall. The path of egress travel of malls shall not exit through anchor buildings. Malls terminating at an anchor building where no other means of egress has been provided shall be considered as a dead-end mall.

**402.4.3.2 Tenant spaces requiring more than one means of egress.** Where more than one means of egress is required from an individual tenant space as determined by Chapter 10, not more than 50 percent of the occupant load shall discharge into the mall.

**402.4.3.3 Large assembly occupancy.** Assembly occupancies with an occupant load of 500 or more shall be so located in the covered mall building such that their entrance will be immediately adjacent to a

principal entrance to the mall and shall have not less than one-half of their required means of egress opening directly to the exterior of the covered mall building.

**402.4.4 Distance to exits.** The maximum permitted travel distance to exits in covered mall buildings shall be in accordance with this section.

**402.4.4.1 Distance to exits within tenant spaces.** The maximum travel distance from any point within an individual tenant space to its entrance to the mall or to an exit shall not exceed 200 feet (60 960 mm).

**402.4.4.2 Distance to exits within the mall.** The maximum distance of travel from any point within a mall to an exit shall not exceed 200 feet (60 960 mm).

**402.4.5 Access to exits.** Where more than one exit is required, they shall be so arranged that it is possible to travel in either direction from any point in a mall to separate exits. However, in dead ends not exceeding a length equal to twice the width of the mall measured at the narrowest location within the dead end portion of the mall, one direction of travel shall be permitted. The minimum width of an exit passageway or corridor from a mall shall be 66 inches (1676 mm).

**402.4.5.1 Exit passageway enclosures.** Where exit passageway enclosures provide a secondary means of egress from a tenant space, doors to the exit passageway enclosures shall be minimum 1-hour fire doors with panic hardware. Such doors shall be self-closing and be so maintained or shall be automatic closing by smoke detection.

**402.4.6 Service areas fronting on exit passageways.** Mechanical rooms, electrical rooms, building service areas and service elevators are permitted to open directly into exit passageways provided that the exit passageway is separated from such rooms by fire barriers providing the same fire-resistance rating as required for the exit passageway. Door swings from these rooms shall not project into the minimum width of such exit passageways.

**402.5 Mall width.** For the purpose of providing required egress, malls are permitted to be considered as corridors but need not comply with the requirements of Section 1005.1 of this code where the width of the mall is as specified in this section.

**402.5.1 Minimum width.** The minimum width of the mall shall be 20 feet (6096 mm). The mall width shall be sufficient to accommodate the occupant load served. There shall be a minimum of 10 feet (3048 mm) clear width to a height of 8 feet (2438 mm) between any projection of a tenant space bordering the mall and the nearest kiosk, vending machine, bench, display opening, food court or other obstruction to means of egress travel.

**402.5.2 Minimum width open mall.** The minimum floor and roof opening width above grade shall be 20 feet (6096 mm) in open malls.

**402.6 Types of construction.** Covered mall buildings, including anchor buildings, shall be only of Type I, II, and IV construction. Their areas shall not be limited provided



NYC that the covered mall building and attached anchor buildings and parking garages are surrounded on all sides by a permanent open space of not less than 60 feet (18 288 mm) and the anchor buildings do not exceed three stories in height. The height of covered mall buildings, including anchor buildings, of Type IIB construction shall be limited to one story. The allowable height and area of anchor buildings greater than three stories in height shall comply with Section 503, as modified by Sections 504 and 506. The construction type of open parking garages and enclosed parking garages shall comply with Sections 406.3 and 406.4, respectively.

**402.6.1 Reduced open space.** The permanent open space of 60 feet (18 288 mm) shall be permitted to be reduced to not less than 40 feet (12 192 mm), provided the following requirements are met:

1. The reduced open space shall not be allowed for more than 75 percent of the perimeter of the covered mall building and anchor buildings.
2. The exterior wall facing the reduced open space shall have a minimum fire-resistance rating of 3 hours.
3. Openings in the exterior wall facing the reduced open space shall have opening protectives with a minimum fire protection rating of 3 hours.
4. Group E, H, I or R occupancies are not within the covered mall building or anchor stores.

**402.7 Fire-resistance-rated separation.** Fire-resistance-rated separation is not required between tenant spaces and the mall. Fire-resistance-rated separation is not required between a food court and adjacent tenant spaces or the mall.

NYC **402.7.1 Attached garage.** An attached parking garage for the storage of passenger vehicles having a capacity of not more than nine persons and open parking garages shall be considered as a separate building where it is separated from the covered mall building by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**Exception:** Where an open parking garage or enclosed parking garage is separated from the covered mall building or anchor building by a distance greater than 10 feet (3048 mm), the provisions of Table 602 shall apply. Pedestrian walkways and tunnels that attach the open parking garage or enclosed parking garage to the covered mall building or anchor building shall be constructed in accordance with Section 3104.

**402.7.2 Tenant separations.** Each tenant space shall be separated from other tenant spaces by a fire partition complying with Section 709. A tenant separation wall is not required between any tenant space and the mall.

**402.7.3 Anchor building separation.** An anchor building shall be separated from the covered mall building by fire walls complying with Section 706.

**Exception:** Anchor buildings of not more than three stories above grade that have an occupancy classification of the same uses permitted as tenants of the cov-

ered mall building shall be separated by 2-hour fire resistive fire barriers complying with Section 707. Openings between such buildings and the mall need not be protected. NYC

**402.8 Interior finish.** Interior wall and ceiling finishes within the mall and exits shall have a minimum flame spread index and smoke-developed index of Class B in accordance with Chapter 8. Interior floor finishes shall meet the requirements of Section 804.

**402.9 Automatic sprinkler system.** The covered mall building and buildings connected shall be provided throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, that shall comply with the following: NYC

1. The automatic sprinkler system shall be complete and operative throughout occupied space in the covered mall building prior to occupancy of any of the tenant spaces. Unoccupied tenant spaces shall be similarly protected unless provided with approved alternate protection. NYC
2. Sprinkler protection for the mall shall be independent from that provided for tenant spaces or anchors. Where tenant spaces are supplied by the same system, they shall be independently controlled.

**Exception:** An automatic sprinkler system shall not be required in spaces or areas of open parking garages constructed in accordance with Section 406.2. NYC

**402.9.1 Standpipe system.** The covered mall building shall be equipped throughout with a standpipe system as required by Section 905.3.3.

**402.10 Smoke control.** A smoke control system shall be provided in accordance with Section 909 for malls greater than one story in height. NYC

**Exception:** A smoke control system is not required in an open mall. NYC

**402.11 Kiosks.** Kiosks and similar structures (temporary or permanent) shall meet the following requirements:

1. Combustible kiosks or other structures shall not be located within the mall unless constructed of any of the following materials:
  - 1.1. Fire-retardant-treated wood complying with Section 2303.2.
  - 1.2. Foam plastics having a maximum heat release rate not greater than 100 kW (105 Btu/h) when tested in accordance with the exhibit booth protocol in UL 1975. NYC
  - 1.3. Aluminum composite material (ACM) having a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723.
2. Kiosks or similar structures located within the mall shall be provided with approved fire suppression and detection devices. NYC

3. The minimum horizontal separation between kiosks or groupings thereof and other structures within the mall shall be 20 feet (6096 mm).
4. Each kiosk or similar structure or groupings thereof shall have a maximum area of 300 square feet (28 m<sup>2</sup>).

**402.12 Children's playground structures.** Structures intended as children's playgrounds that exceed 10 feet (3048 mm) in height and 150 square feet (14 m<sup>2</sup>) in area shall comply with Sections 402.12.1 through 402.12.4.

**402.12.1 Materials.** Children's playground structures shall be constructed of noncombustible materials or of combustible materials that comply with the following:

1. Fire-retardant-treated wood.
2. Light-transmitting plastics complying with Section 2606.
3. Foam plastics (including the pipe foam used in soft-contained play equipment structures) having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975.
4. Aluminum composite material (ACM) meeting the requirements of Class A interior finish in accordance with Chapter 8 when tested as an assembly in the maximum thickness intended for use.
5. Textiles and films complying with the flame propagation performance criteria contained in NFPA 701.
6. Plastic materials used to construct rigid components of soft-contained play equipment structures (such as tubes, windows, panels, junction boxes, pipes, slides and decks) exhibiting a peak rate of heat release not exceeding 400 kW/m<sup>2</sup> when tested in accordance with ASTM E 1354 at an incident heat flux of 50 kW/m<sup>2</sup> in the horizontal orientation at a thickness of 1/4 inch (6 mm).†
7. Ball pool balls, used in soft-contained play equipment structures, having a maximum heat-release rate not greater than 100 kilowatts when tested in accordance with UL 1975. The minimum specimen test size shall be 36 inches by 36 inches (914 mm by 914 mm) by an average of 21 inches (533 mm) deep, and the balls shall be held in a box constructed of galvanized steel poultry netting wire mesh.
8. Foam plastics shall be covered by a fabric, coating or film meeting the flame propagation performance criteria of NFPA 701.
9. The floor covering placed under the children's playground structure shall exhibit a Class I interior floor finish classification, as described in Section 804, when tested in accordance with NFPA 253.

**402.12.2 Fire protection.** Children's playground structures located within the mall shall be provided with the same level of approved fire suppression and detection devices required for kiosks and similar structures.

**402.12.3 Separation.** Children's playground structures shall have a minimum horizontal separation from other structures within the mall of 20 feet (6090 mm).

**402.12.4 Area limits.** Children's playground structures shall not exceed 300 square feet (28 m<sup>2</sup>) in area. NYC

**402.13 Security grilles and doors.** Horizontal sliding or vertical security grilles or doors that are a part of a required means of egress shall conform to the following:

1. They shall remain in the full open position during the period of occupancy by the general public.
2. Doors or grilles shall not be brought to the closed position when there are 10 or more persons occupying spaces served by a single exit or 50 or more persons occupying spaces served by more than one exit.
3. The doors or grilles shall be openable from within without the use of any special knowledge or effort where the space is occupied.
4. Where two or more exits are required, not more than one-half of the exits shall be permitted to include either a horizontal sliding or vertical rolling grille or doors. NYC

**402.14 Standby power.** Covered mall buildings exceeding 50,000 square feet (4645 m<sup>2</sup>) shall be provided with standby power systems that are capable of operating the emergency voice/alarm communication system.

**402.15 Emergency voice/alarm communication system.** Covered mall buildings exceeding 50,000 square feet (4645 m<sup>2</sup>) in total floor area shall be provided with an emergency voice/alarm communication system. Emergency voice/alarm communication systems serving a mall, required or otherwise, shall be accessible to the Fire Department. The system shall be provided in accordance with Section 907.2.12.2. NYC

**402.16 Plastic signs.** Plastic signs affixed to the storefront of any tenant space facing the mall shall be limited as specified in Sections 402.16.1 through 402.16.5. NYC

**402.16.1 Area.** Plastic signs shall not exceed 20 percent of the wall area facing the mall.

**402.16.2 Height and width.** Plastic signs shall not exceed a height of 36 inches (914 mm), except if the sign is vertical, the height shall not exceed 96 inches (2438 mm) and the width shall not exceed 36 inches (914 mm). NYC

**402.16.3 Location.** Plastic signs shall be located a minimum distance of 18 inches (457 mm) from adjacent tenants.

**402.16.4 Plastics other than foam plastics.** Plastics other than foam plastics used in signs shall be light-transmitting plastics complying with Section 2606.4 or shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D 1929, and a flame spread index not greater than 75 and smoke-developed index not greater than 450 when tested in the manner intended for use in accordance with ASTM E 84 or meet the acceptance criteria of Section 803.2.1 when tested in accordance with NFPA 286. NYC  
NYC

**402.16.4.1 Encasement.** Edges and backs of plastic signs in the mall shall be fully encased in metal.

**402.16.5 Foam plastics.** Foam plastics used in signs shall have flame-retardant characteristics such that the sign has a maximum heat-release rate of 150 kilowatts when tested in accordance with UL 1975 and the foam plastics shall

have the physical characteristics specified in this section. Foam plastics used in signs installed in accordance with Section 402.14 shall not be required to comply with the flame spread and smoke-developed indexes specified in Section 2603.3.

**402.16.5.1 Density.** The minimum density of foam plastics used in signs shall not be less than 20 pounds per cubic foot (pcf) (320 kg/m<sup>3</sup>).

**402.16.5.2 Thickness.** The thickness of foam plastic signs shall not be greater than 1/2 inch (12.7 mm).

**402.17 Fire Department access to equipment.** Rooms or areas containing controls for air-conditioning systems, automatic fire-extinguishing systems or other detection, suppression or control elements shall be identified for use by the Fire Department.

## SECTION BC 403 HIGH-RISE BUILDINGS

**403.1 Applicability.** High-rise buildings shall comply with Sections 403.2 through 403.8.

**Exception:** The provisions of this section shall not apply to the following buildings and structures:

1. Air traffic control towers in accordance with Section 412.3.
2. Buildings occupied entirely by Group R-3 classification.
3. Open parking garages in accordance with Section 406.3.
4. Buildings with an occupancy in Group A-5 in accordance with Section 303.1.
5. Low-hazard special industrial occupancies in accordance with Section 503.1.1.
6. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.

**403.2 Construction.** The construction of high-rise buildings shall comply with the provisions of Sections 403.2.1 through 403.2.4.

**403.2.1 Types of construction.** The following modifications to the minimum fire-resistance rating of the building elements in Table 601 shall be as follows:

1. High rise buildings 420 feet (128 000 mm) or greater in building height shall be constructed of Type IA construction.
2. For high rise buildings not greater than 420 feet (128 000 mm) in building height, and constructed to meet the fire-resistance rating requirements of Type IB or IIA construction, the required fire-resistance rating of columns supporting floors shall be constructed to meet Type IA construction.

**403.2.2 Seismic considerations.** For seismic considerations, see Chapter 16.

**403.2.3 Structural integrity of exit enclosures and elevator hoistway enclosures.** For all high-rise buildings,

exit enclosures and elevator hoistway enclosures shall comply with Sections 403.2.3.1 through 403.2.3.4.

**403.2.3.1 Wall assembly.** The wall assemblies making up the exit enclosures and elevator hoistway enclosures shall meet or exceed Soft Body Impact Classification Level 2 as measured by the test method described in ASTM C 1629/C 1629M.

**403.2.3.2 Wall assembly materials.** The face of the wall assemblies making up the exit enclosures and elevator hoistway enclosures that are not exposed to the interior of the exit enclosure or elevator hoistway enclosure shall be constructed in accordance with one of the following methods:

1. The wall assembly shall incorporate not less than two layers of impact-resistant construction board each of which meets or exceeds Hard Body Impact Classification Level 2 as measured by the test method described in ASTM C 1629/C 1629M.
2. The wall assembly shall incorporate not less than one layer of impact-resistant construction material that meets or exceeds Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C 1629/C 1629M.
3. The wall assembly incorporates multiple layers of any material, tested in tandem, that meet or exceed Hard Body Impact Classification Level 3 as measured by the test method described in ASTM C 1629/C 1629M.

**403.2.3.3 Concrete and masonry walls.** Concrete or masonry walls shall be deemed to satisfy the requirements of Sections 403.2.3.1 and 403.2.3.2.

**403.2.3.4 Other wall assemblies.** Any other wall assembly that provides impact resistance equivalent to that required by Sections 403.2.3.1 and 403.2.3.2 for Hard Body Impact Classification Level 3, as measured by the test method described in ASTM C 1629/C 1629M, shall be permitted.

**403.2.4 Sprayed fire-resistant materials (SFRM).** The bond strength of the SFRM installed throughout the building shall be in accordance with Table 403.2.4.

**TABLE 403.2.4  
MINIMUM BOND STRENGTH**

HEIGHT OF BUILDING <sup>a</sup>	SFRM MINIMUM BOND STRENGTH
Up to 420 feet	430 psf
Greater than 420 feet	1,000 psf

For SI: 1 foot = 304.8 mm, 1 pound per square foot (psf) = 0.0479 kW/m<sup>2</sup>.

a. Above the lowest level of fire department vehicle access.

**403.3 Automatic sprinkler system.** Buildings and structures shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. A secondary water supply shall be provided where required by Section 903.3.5.2.



[illegible]

nearest points of the exit stairway enclosures. In buildings with three or more exit stairway enclosures, at least two of the exit stairway enclosures shall comply with this section. Stairs sharing any common wall, floors, ceilings, scissor stair assemblies, or other enclosures shall be counted as one exit stairway.

**Exception:** Group R-2 occupancies.

**403.5.2 Additional exit stairway.** For buildings other than Group R-2 that are more than 420 feet (128 m) in building height, one additional exit stairway meeting the requirements of Sections 1009 and 1022 shall be provided in addition to the minimum number of exits required by Section 1021.1. The total width of any combination of remaining exit stairways with one exit stairway removed shall not be less than the total width required by Section 1005.1. Stairs sharing any common wall, floors, ceilings, scissor stair assemblies, or other enclosures shall not be considered the additional exit stairway required by this section.

**Exceptions:** An additional exit stairway shall not be required to be installed in any of the following instances:

1. In buildings where all passenger elevators for general public use and all other elevators used for occupant self-evacuation comply with Sections 3008.1 through 3008.11;
2. In buildings where all of the following conditions are met:
  - 2.1. The commissioner has approved a timed egress analysis establishing the egress time it would take for a full building evacuation, utilizing the stairs required by Section 1021.1 and the additional stair that would have been required pursuant to Section 403.5.2;
  - 2.2. The commissioner has approved a timed egress analysis establishing the egress time it would take for a full building evacuation, utilizing the combination of the stairs required by Section 1021.1 and elevators used for occupant self-evacuation as follows:
    - 2.2.1. Such analysis need only utilize a number of designated elevators designed for occupant self-evacuation necessary to demonstrate an evacuation time that is less than the time established in Exception 2.1; and
    - 2.2.2. Every bank of passenger elevators for general public use shall be served by at least one such designated elevator;
  - 2.3. All elevators in the building that either are passenger elevators for general public use or are used for occupant self-evacuation shall comply with Sections 3008.1 through

3008.11. However, the standby power generating equipment required by Section 3008.9 need only be sized to satisfy the loads required to simultaneously operate those elevators identified in the timed egress analysis described in Exception 2.2.

The minimum number of exits required by Section 1021.1 are all at least 25 percent wider than the exit width required by Chapter 10. The increase in the stair width shall not be utilized in the timed egress analyses required by Exceptions 2.1 and 2.2; or

3. Where the application for construction document approval is submitted within 18 months after the date of enactment of the local law that added this section.

**403.5.3 Stairway door operation.** Doors opening into interior stair enclosures shall not be locked from either side. However, a door locked from the stair side may be permitted provided that such door is equipped with an automatic fail safe system for opening in the event of the activation of any automatic fire detection system, or when any elevator recall is activated, or when any signal is received from the fire command center. Such door shall be deemed as openable from the stair side. Stair reentry signs shall be posted throughout the stairway indicating that reentry is provided only during fire emergencies. Such signs shall be in accordance with Section 1030.4.2.

**403.5.3.1 Stairway communication system.** A telephone or other two-way communications system connected to an approved constantly attended station shall be provided at not less than every fifth floor in each stairway where the doors to the stairway are locked in accordance with Section 403.5.3.

**403.5.4 Smokeproof exit enclosures.** Every required exit stairway serving floors more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall comply with Sections 909.20 and 1022.9.

**Exception for R-2 occupancies:** Smokeproof enclosures are not required in occupancy Group R-2 unless provided pursuant to Exception 2 of Section 916.1.

**403.5.5 Luminous egress path markings.** Luminous egress path markings shall be provided in accordance with Section 1024 and Appendix S.

**Exception:** Egress paths serving Group R-2.

**403.5.6 Emergency escape and rescue.** Emergency escape and rescue openings required by Section 1029 are not required.

**403.6 Elevators.** Elevator operation and installation shall be in accordance with Chapter 30.

**403.6.1 Fire service access elevator.** In buildings with an occupied floor more than 120 feet (36 576 mm) above the lowest level of fire department vehicle access, a minimum of one fire service access elevator shall be provided in accordance with Section 3007.



**403.6.2 Occupant evacuation elevators.** Where installed in accordance with Section 3008, passenger elevators for general public use shall be permitted to be used for occupant self-evacuation.

**403.6.3 Elevator lobbies.** Elevator lobbies shall be provided in accordance with Sections 708.14.1 and 708.14.2.

**403.7 Outdoor air intakes.** For high-rise buildings, outdoor air intakes serving spaces above the second story and serving spaces greater than 10,000 square feet (929 m<sup>2</sup>) of floor area shall be located in accordance with Section 401.5 of the *New York City Mechanical Code*.

**Exception:** Group R-2 occupancy.

**403.8 Open web steel joists.** The use of open web steel joists shall be prohibited in high-rise buildings until the commissioner promulgates rules establishing minimum acceptable fireproofing methods.

## SECTION BC 404 ATRIUMS

**404.1 General.** In other than Group H occupancies, and where permitted by Exception 5 in Section 708.2, the provisions of this section shall apply to buildings or structures containing vertical openings defined herein as atriums.

**404.1.1 Definition.** The following word and term shall, for the purposes of this chapter and as used elsewhere in this code, have the meaning shown herein.

**NYC ATRIUM.** An opening connecting three or more stories other than enclosed stairways, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or any other vertical openings that are not required to be enclosed by other provisions of this code, which is closed at the top and not defined as a mall. Stories, as used in this definition, do not include balconies within assembly groups or mezzanines that comply with Section 505.

**NYC 404.2 Use.** The floor of the atrium shall not be used for other than low fire hazard uses, and only approved materials and decorations in accordance with the *New York City Fire Code* shall be used in the atrium space.

**Exception:** The atrium floor area is permitted to be used for any approved use where the individual space is provided with an automatic sprinkler system in accordance with Section 903.3.1.1.

**404.3 Automatic sprinkler protection.** An approved automatic sprinkler system shall be installed throughout the entire building.

### Exceptions:

1. That area of a building adjacent to or above the atrium need not be sprinklered provided that portion of the building is separated from the atrium portion by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712 or both.

2. Where the ceiling of the atrium is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the atrium is not required.

**404.4 Fire alarm system.** A fire alarm system shall be provided in accordance with Section 907.2.14.

**404.5 Smoke control.** A smoke control system shall be installed in accordance with Section 909.

**404.6 Enclosure of atriums.** Atrium spaces shall be separated from adjacent spaces by a 1-hour fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 712, or both.

### Exceptions:

1. A glass or glass-block wall forming a smoke partition where automatic sprinklers are spaced 6 feet (1829 mm) or less along both sides of the separation wall, or on the room side only if there is not a walkway on the atrium side, and between 4 inches and 12 inches (102 mm and 305 mm) away from the glass and so designed that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction. The glass shall be installed in a gasketed frame so that the framing system deflects without breaking (loading) the glass before the sprinkler system operates.
2. The adjacent spaces of any three floors of the atrium shall not be required to be separated from the atrium where such spaces are accounted for in the design of the smoke control system.

**404.7 Standby power.** Equipment required to provide smoke control shall be connected to a standby power system in accordance with Section 909.11.

**404.8 Interior finish.** The interior finish of walls and ceilings of the atrium shall not be less than Class B with no reduction in class for sprinkler protection.

**404.9 Travel distance.** In other than the lowest level of the atrium, where the required means of egress is through the atrium space, the portion of exit access travel distance within the atrium space shall not exceed 200 feet (60 960 mm). The travel distance requirements for areas of buildings open to the atrium and where access to the exits is not through the atrium, shall comply with the requirements of Section 1016.

## SECTION BC 405 UNDERGROUND BUILDINGS AND SPACES

**405.1 General.** The provisions of this section apply to building spaces having a floor level used for human occupancy more than 30 feet (9144 mm) below the finished floor of the lowest level of exit discharge.

### Exceptions:

1. One- and two-family dwellings, sprinklered in accordance with Section 903.3.1.3.
2. Parking garages with automatic sprinkler systems in compliance with Section 405.3.

3. Fixed guideway transit systems.
4. Grandstands, bleachers, stadiums, arenas and similar facilities.
5. Where the lowest story is the only story that would qualify the building as an underground building and has an area not exceeding 1,500 square feet (139 m<sup>2</sup>) and has an occupant load less than 10.
6. Pumping stations and other similar mechanical spaces intended only for limited periodic use by service or maintenance personnel.

**405.2 Construction requirements.** The underground portion of the building shall be of Type I construction.

**405.3 Automatic sprinkler system.** The highest level of exit discharge serving the underground portions of the building and all levels below shall be equipped with an automatic sprinkler system installed in accordance with Section 903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4.

**405.4 Compartmentation.** Compartmentation shall be in accordance with Sections 405.4.1 through 405.4.3.

**405.4.1 Number of compartments.** A building having a floor level more than 60 feet (18 288 mm) below the finished floor of the lowest level of exit discharge shall be divided into a minimum of two compartments of approximately equal size. Such compartmentation shall extend through the highest level of exit discharge serving the underground portions of the building and all levels below.

**Exception:** The lowest story need not be compartmented where the area does not exceed 1,500 square feet (139 m<sup>2</sup>) and has an occupant load of less than 10.

**NYC** **405.4.2 Compartment separation.** The separation between the two compartments shall be of minimum 2-hour fire barrier wall construction that shall extend from floor slab to floor deck above. Penetrations between the two compartments shall be limited to plumbing and electrical piping and conduit that are firestopped in accordance with Section 713. Doorways shall be protected by door assemblies that are automatic-closing by smoke detection in accordance with Section 715.4.8.3 and are installed in accordance with NFPA 105 and Section 715.4.3. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.

**NYC** **405.4.3 Elevators.** Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a 2-hour fire barrier. Doors shall be gasketed, have a drop sill, and be automatic-closing by smoke detection installed in accordance with Section 715.4.8.3.

**405.5 Smoke control system.** A smoke control system shall be provided in accordance with Sections 405.5.1 and 405.5.2.

**405.5.1 Control system.** A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain means of egress in a usable condition.

tion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain means of egress in a usable condition.

**405.5.2 Compartment smoke control system.** Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Sections 907.2.18 and 907.2.19.

**405.6 Fire alarm systems.** A fire alarm system shall be provided where required by Sections 907.2.18 and 907.2.19.

**405.7 Means of egress.** Means of egress shall be in accordance with Sections 405.7.1 and 405.7.2.

**405.7.1 Number of exits.** Each floor level shall be provided with a minimum of two exits. Where compartmentation is required by Section 405.4, each compartment shall have a minimum of one exit and shall also have an exit access doorway into the adjoining compartment.

**405.7.2 Smokeproof enclosure.** Every required stairway serving floor levels more than 30 feet (9144 mm) below its level of exit discharge shall comply with the requirements for a smokeproof enclosure as provided in Section 1022.9.

**405.8 Standby power.** A standby power system complying with Section 2702 shall be provided for standby power loads specified in Section 405.8.1.

**405.8.1 Standby power loads.** The following loads are classified as standby power loads:

1. Smoke control system;
2. Ventilation and automatic fire detection equipment for smokeproof enclosures;
3. Fire pumps;
4. Elevators in accordance with Section 3003; and
5. Stair pressurization systems when provided.

**405.9 Emergency power.** An emergency power system complying with Section 2702 shall be provided for emergency power loads specified in Section 405.9.1.

**405.9.1 Emergency power loads.** The following loads are classified as emergency power loads:

1. Emergency voice/alarm communications systems, including Fire Department in-building Auxiliary Radio Communication systems (ARCs) provided where required or installed voluntarily in accordance with Section 917;
2. Fire alarm systems;
3. Automatic fire detection systems;
4. Elevator car lighting; and
5. Means of egress and exit sign illumination as required by Chapter 10.

**405.10 Standpipe system.** The underground building shall be provided throughout with a standpipe system in accordance with Section 905.

## SECTION BC 406 MOTOR-VEHICLE-RELATED OCCUPANCIES

### 406.1 Private garages and carports.

**406.1.1 Classification.** Private garages and carports, as defined by this section, shall be classified as Group U occupancy.

**406.1.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**CARPORT.** A structure or portion of a structure, accessory to a Group R-2 or R-3 occupancy, open on at least two sides and unenclosed for at least 50 percent of perimeter, used for the parking or storage of passenger motor vehicles. Such facility shall not exceed 650 square feet (60.45 m<sup>2</sup>) in area and one story in height.

**PRIVATE GARAGE.** An enclosed structure or portion of a structure, accessory to a Group R-2 or R-3 occupancy, used for the parking or storage of passenger motor vehicles. Such facility shall not exceed 650 square feet (60 m<sup>2</sup>) in area and one story in height.

**406.1.3 Floor construction.** Private garage and carport floors shall be of concrete or equivalent noncombustible material that will not absorb flammable liquids. The area of floor used for parking of vehicles shall be sloped to facilitate the movement of liquids to a drain. The sills of all door openings connecting a dwelling unit to a private garage shall be raised at least 4 inches (102 mm) above the floor level of the garage.

**Exception:** Asphalt surfaces shall be permitted at ground level in carports.

**406.1.3.1 Ramps.** Ramps shall have a gradient not exceeding one in seven, with nonslip surfaces, and shall be located entirely within the property line. However, upon application to the commissioner, steeper gradients may be accepted, but in no event greater than one in three.

**406.1.4 Separation.** Separations shall comply with the following:

1. The private garage shall be separated from the dwelling unit and its attic area by means of a minimum 1-hour fire-rated construction. Garages beneath habitable rooms shall be separated from all habitable rooms above by not less than 1-hour fire-rated construction. Openings from a private garage directly into a room used for sleeping purposes shall not be permitted.
2. No air used for heating, cooling or ventilation shall be circulated through private garages to dwelling areas.
3. A separation is not required between a Group R-3 occupancy and a carport, provided the carport does not have any enclosed areas above.
4. For free standing private garages where the fire separation distance from the nearest exterior wall is less than 5 feet (1524 mm)±, such exterior walls shall have a fire-resistance rating not less than one hour.

**406.1.5 Automatic garage door openers.** Automatic garage door openers, if provided, shall be listed in accordance with UL 325.

### 406.2 Parking garages, open or enclosed.

**406.2.1 Classification.** Parking garages shall be either open, as per Section 406.3, or enclosed, as per Section 406.4. Parking garages shall also comply with the special provisions of Section 510.

**406.2.2 Clear height.** The clear height of each floor level in vehicle and pedestrian traffic areas shall not be less than 7 feet (2134 mm). Vehicle and pedestrian areas accommodating van-accessible parking required by Section 1106.5 shall conform to ICC A117.1.

**406.2.3 Guards.** Guards shall be provided in accordance with Section 1013. Guards serving as vehicle barrier systems shall comply with Sections 406.2.4 and 1013.

**406.2.4 Vehicle barrier systems.** Vehicle barrier systems not less than 2 feet 9 inches (835 mm) high shall be placed at the end of drive lanes and at the end of parking spaces where the vertical distance to the ground or surface directly below is greater than 1 foot (305 mm). Vehicle barrier systems shall comply with the loading requirements of Section 1607.7.3.

**Exception:** Vehicle storage compartments in a mechanical access parking garage.

**406.2.5 Ramps.** Ramps shall have a gradient not exceeding one in seven, with nonslip surfaces. A level landing having a minimum dimension of 20 feet (6096 mm) shall be provided at the discharge point of all ramps at the street level, within the property line. Ramps used for the movement of motor vehicles need not be enclosed when serving tiers above grade. Vehicle ramps may serve as part of a means of egress provided that such ramp complies with the requirements of Sections 1018.1.1 and 1018.1.2.

**406.2.6 Floor surface.** Parking surfaces shall be of concrete or similar noncombustible and nonabsorbent materials. The area of floor used for parking of vehicles shall be sloped to facilitate the movement of liquids to a drain.

#### Exceptions:

1. Asphalt parking surfaces are permitted at ground level.
2. Floors of Group S-2 parking garages shall not be required to have a sloped surface.

**406.2.7 Separation.** Parking garages shall be separated from other occupancies in accordance with Section 510.

**406.2.8 Special hazards.** Openings from a parking garage to any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation. Such vestibule and doorway shall be minimum 1-hour rated construction.

**Exception:** A single door, in compliance with Table 715.4, shall be permitted, provided the sources of ignition in the appliance are at least 18 inches (457 mm) above the floor.



**406.2.9 Attached to rooms.** Openings from a parking garage directly into a room used for sleeping purposes shall not be permitted.

**406.2.10 Fire-fighter aisles.** In any parking garage or lot, one or more aisles, at least 24 inches (610 mm) in width, shall be provided to permit access by fire-fighting personnel to all parts of the garage or lot. There shall not be more than three rows of parked motor vehicles between aisles.

**406.2.11 Electric vehicle charging stations.** Parking garages shall be capable of supporting electrical vehicle charging stations in accordance with this section. Electrical raceway to the electrical supply panel serving the garage shall be capable of providing a minimum of 3.1 kW of electrical capacity to at least 20 percent of the parking spaces of the garage. The electrical room supplying the garage must have the physical space for an electrical supply panel sufficient to provide 3.1kW of electrical capacity to at least 20 percent of the parking spaces of the garage. Such raceway and all components and work appurtenant thereto shall be in accordance with the *New York City Electrical Code*.

**Exceptions:**

1. The provisions of this section shall not apply to parking garages for buildings of Occupancy Group M (Mercantile).
2. The commissioner may waive compliance with this section if the commissioner determines that the parking garage is a temporary facility that will be in service no longer than 3 years.
3. The provisions of this section shall not apply to parking garages for buildings in which not less than fifty percent of the residential units are for households earning up to sixty percent of the area median income as determined by the United States Department of Housing and Urban Development.

**406.3 Open parking garages.**

**406.3.1 Scope.** Except where specific provisions are made in Sections 406.3.2 through 406.3.13, other requirements of this code shall apply.

**406.3.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**MECHANICAL-ACCESS OPEN PARKING GARAGES.** Open parking garages employing parking machines, lifts, elevators or other mechanical devices for vehicles moving from and to street level and in which public occupancy is prohibited above the street level.

**OPEN PARKING GARAGE.** A structure or portion of a structure with the openings as described in Section 406.3.3.1 that is used for the parking or storage of private motor vehicles as described in Section 406.3.4.

**RAMP-ACCESS OPEN PARKING GARAGES.** Open parking garages employing a series of continuously rising floors or a series of interconnecting ramps between floors

permitting the movement of vehicles under their own power from and to the street level.

**406.3.3 Construction.** Open parking garages shall be of Type I, II or IV construction. Open parking garages shall meet the design requirements of Chapter 16. For vehicle barrier systems, see Section 406.2.4.

**406.3.3.1 Openings.** For natural ventilation purposes, the exterior side of the structure shall have uniformly distributed openings on two or more sides. The area of such openings in exterior walls on a tier must be at least 20 percent of the total perimeter wall area of each tier. The aggregate length of the openings considered to be providing natural ventilation shall constitute a minimum of 40 percent of the perimeter of the tier. Interior walls shall be at least 20 percent open with uniformly distributed openings.

**Exception:** Openings are not required to be distributed over 40 percent of the building perimeter where the required openings are uniformly distributed over two opposing sides of the building.

**406.3.4 Uses.** Mixed uses shall be allowed in the same building as an open parking garage subject to the provisions of Sections 402.7.1, 406.3.13, 508.1, 510.3, 510.4, and 510.7.

**406.3.5 Area and height.** Area and height of open parking garages shall be limited as set forth in Chapter 5 for Group S-2 occupancies.

**406.3.5.1 Single use.** When the open parking garage is used exclusively for the parking or storage of private motor vehicles, with no other uses in the building, the area and height shall be permitted to comply with Table 406.3.5.

**Exception:** The grade-level tier is permitted to contain an office, waiting and toilet rooms having a total combined area of not more than 1,000 square feet (93 m<sup>2</sup>). Such area need not be separated from the open parking garage. In open parking garages having a spiral or sloping floor, the horizontal projection of the structure at any cross section shall not exceed the allowable area per parking tier. In the case of an open parking garage having a continuous spiral floor, each 9 feet 6 inches (2896 mm) of height, or portion thereof, shall be considered a tier. The clear height of a parking tier shall not be less than 7 feet (2134 mm), except that a lower clear height is permitted in mechanical-access open parking garages where approved by the commissioner.

**406.3.6 Area and height increases.** The allowable area and height of open parking garages shall be increased in accordance with the provisions of this section. Garages with sides open on three-fourths of the building's perimeter are permitted to be increased by 25 percent in area and one tier in height. Garages with sides open around the entire building's perimeter are permitted to be increased by 50 percent in area and one tier in height. For a side to be considered open under the above provisions, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier and such

**TABLE 406.3.5  
OPEN PARKING GARAGES AREA AND HEIGHT**

TYPE OF CONSTRUCTION	AREA PER TIER (square feet)	HEIGHT (in tiers)		
		Ramp access	Mechanical access	
			Automatic sprinkler system	
			No	Yes
IA	Unlimited	Unlimited	Unlimited	Unlimited
IB	Unlimited	12 tiers	12 tiers	18 tiers
IIA	50,000	10 tiers	10 tiers	15 tiers
IIB	50,000	8 tiers	8 tiers	12 tiers
IV	50,000	4 tiers	4 tiers	4 tiers

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

openings shall be equally distributed along the length of the tier.

Allowable tier areas in Table 406.3.5 shall be increased for open parking garages constructed to heights less than the table maximum. The gross tier area of the garage shall not exceed that permitted for the higher structure. At least three sides of each such larger tier shall have continuous horizontal openings not less than 30 inches (762 mm) in clear height extending for at least 80 percent of the length of the sides and no part of such larger tier shall be more than 200 feet (60 960 mm) horizontally from such an opening. In addition, each such opening shall face a street or yard accessible to a street with a width of at least 30 feet (9144 mm) for the full length of the opening, and standpipes shall be provided in each such tier.

Open parking garages of Type II construction, with all sides open, shall be unlimited in allowable area where the building height does not exceed 75 feet (22 860 mm). For a side to be considered open, the total area of openings along the side shall not be less than 50 percent of the interior area of the side at each tier and such openings shall be equally distributed along the length of the tier. All portions of tiers shall be within 200 feet (60 960 mm) horizontally from such openings or other natural ventilation openings as defined in Section 406.3.3.1. These openings shall be permitted to be provided in courts with a minimum dimension of 20 feet (6096 mm) for the full width of the openings.

**406.3.7 Fire separation distance.** Exterior walls and openings in exterior walls shall comply with Tables 601 and 602. The distance from an adjacent property line shall be determined in accordance with Table 602 and Section 705.

**406.3.8 Means of egress.** Open parking garages shall meet the means of egress requirements of Chapter 10. However, where no persons other than parking attendants are permitted, required exit stairways shall not be less than 36 inches (914 mm) wide.

**406.3.9 Standpipes.** Standpipes shall be installed where required by the provisions of Section 905.

**406.3.10 Sprinkler systems.** Automatic sprinkler systems and standpipes shall be installed in accordance with the

provisions of Section 903. An automatic dry sprinkler system may be installed in unheated garages. **NYC  
NYC**

**406.3.11 Enclosure of vertical openings.** Enclosure shall not be required for vertical openings. **NYC  
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NYC**

**406.3.12 Ventilation.** Openings specified in Section 406.3.3.1 shall satisfy natural ventilation requirements. Additional mechanical ventilation shall not be required. **NYC  
NYC  
NYC  
NYC  
NYC**

**406.3.13 Prohibitions.** The following uses and alterations are not permitted:

1. Vehicle repair work.
2. Parking of commercial vehicles, buses, trucks and similar vehicles. **NYC**
3. Partial or complete closing of required openings in exterior walls by tarpaulins or any other means.
4. Dispensing of fuel.

**406.4 Enclosed parking garages.** Parking garages and portions thereof that do not meet the definition of "Open parking garages" shall be classified as an enclosed parking garage and shall meet the requirements of this section. **NYC  
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NYC  
NYC  
NYC  
NYC**

**406.4.1 Heights and areas.** Enclosed parking garages shall be limited to the allowable heights and areas specified in Table 503 as modified by Sections 504, 506, and 507. Permitted roof parking shall not be considered as a separate story. **NYC  
NYC**

**406.4.2 Ventilation.** A mechanical ventilation system shall be provided in accordance with the *New York City Mechanical Code*. **NYC**

#### **406.5 Motor fuel-dispensing facilities.**

**406.5.1 Construction.** Motor fuel-dispensing facilities shall be designed and constructed in accordance with the *New York City Fire Code* and Sections 406.5.1 through 406.5.3 of this code. **NYC  
NYC  
NYC**

**406.5.2 Vehicle fueling pad.** The vehicle shall be fueled on noncoated concrete or other approved paving material having a resistance not exceeding 1 megohm as determined by the methodology in EN 1081.

**406.5.3 Canopies.** Canopies under which fuels are dispensed shall have a clear, unobstructed height of not less than 14 feet (4267 mm) to the lowest projecting element in the vehicle drive-through area. Canopies and their sup- **NYC**



ports over pumps shall be of noncombustible materials. However, panels constructed of light-transmitting plastic materials shall be permitted to be installed in canopies erected over motor vehicle fuel-dispensing station fuel dispensers, provided the panels are located at least 10 feet (3048 mm) from any building on the same property and face yards or streets not less than 40 feet (12 192 mm) in width on the other sides. The aggregate areas of plastics shall not exceed 1,000 square feet (93 m<sup>2</sup>). The maximum area of any individual panel shall not exceed 100 square feet (9.3 m<sup>2</sup>).

**406.5.3.1 Canopies used to support gaseous hydrogen systems.** Where flammable compressed gases are permitted by the *New York City Fire Code* to be located on the roof of a canopy that is used to shelter dispensing operations, such canopy shall be in accordance with the following:

1. The canopy shall meet or exceed Type I construction requirements.
2. Operations located under canopies shall be limited to refueling only.
3. The canopy shall be constructed in a manner that prevents the accumulation of hydrogen gas.

**406.5.4 Storage tanks.** Motor fuel storage tanks shall be installed below ground, except as authorized by the rules of the Fire Department. The installation and venting of storage tanks shall be in accordance with the rules of the Fire Department and the requirements of the *New York City Fire Code*. Storage tanks installed below ground shall comply with the following:

1. The top of the storage tanks shall be at least 24 inches (610 mm) below finished grade and at least 24 inches (610 mm) below the level of any cellar or basement floor within 10 feet (3048 mm) of the tanks.
2. Storage tanks shall be located so that the forces from any building foundation and support loads are not transmitted to the tanks. The distance from any part of a storage tank to the nearest wall of any basement, pit or cellar, or from any property line that may be built upon, shall not be less than 36 inches (914 mm).
3. Storage tanks shall be covered with a structurally supported reinforced concrete slab at least 8 inches (203 mm) thick, extending at least 12 inches (305 mm) beyond the horizontal outlines of the storage tanks, and placed over a cover of suitable clean backfill material. Such slab shall be designed and reinforced in accordance with ACI 318. All concrete shall have a minimum compressive strength of 4,000 pounds per square inch (27 580 kPa) at 28 days.
4. Storage tanks shall be placed on a 12-inch (305 mm) thick concrete base slab or installed in such other manner, secured against flotation, and approved by the department.

## 406.6 Repair garages.

**406.6.1 General.** Repair garages shall be constructed in accordance with the *New York City Fire Code* and Sections 406.6.1 through 406.6.6. This occupancy shall not include motor fuel-dispensing facilities, as regulated in Section 406.5.

**406.6.2 Mixed uses.** Mixed uses shall be allowed in the same building as a repair garage subject to the provisions of Section 508.1.

**406.6.3 Ventilation.** Repair garages shall be mechanically ventilated in accordance with the *New York City Mechanical Code*. The ventilation system shall be controlled at the entrance to the garage.

**406.6.4 Floor surface.** Repair garage floors shall be of concrete or similar noncombustible and nonabsorbent materials.

**Exception:** Slip-resistant, nonabsorbent, interior floor finishes having a critical radiant flux not more than 0.45 W/cm<sup>2</sup>, as determined by NFPA 253, shall be permitted.

**406.6.5 Heating equipment.** Heating equipment shall be installed in accordance with the *New York City Mechanical Code*.

**406.6.6 Gas detection system.** Repair garages used for repair of vehicles fueled by CNG, LNG, or hydrogen, shall be provided with an approved flammable gas-detection system.

**406.6.6.1 System design.** The flammable gas-detection system shall be calibrated to the types of fuels or gases used by vehicles to be repaired. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 percent of the lower explosive limit. Gas detection shall also be provided in lubrication or chassis repair pits of garages used for repairing nonodorized LNG-fueled vehicles.

**406.6.6.2 Operation.** Activation of the gas detection system shall result in all of the following:

1. Initiation of distinct audible and visual alarm signals in the repair garage.
2. Deactivation of all heating systems located in the repair garage.
3. Activation of the mechanical ventilation and exhaust system, where the system is interlocked with gas detection.

**406.6.6.3 Failure of the gas detection system.** Failure of the gas detection system shall result in the deactivation of the heating system, activation of the mechanical ventilation system when the system is interlocked with the gas detection system and cause a trouble signal to sound in an approved location.

## 406.7 Open parking lots.

**406.7.1 General.** The provisions of this section shall govern the construction of open parking lots and to all such existing premises hereafter enlarged or changed in location.

**406.7.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**OPEN PARKING LOT.** An exterior space with surfacing at grade used for the storage or sale of more than four motor vehicles, including but not limited to parking lots, motor vehicles sales lots, and accessory open parking spaces.

**406.7.3 Permit required.** Any premise intended to be occupied for the storage or sale of motor vehicles on an open parking lot shall require an application to be filed with the department in order to obtain a Certificate of Occupancy. Such Certificate of Occupancy shall indicate the maximum number of vehicles to be accommodated and the type of vehicle, whether private passenger or commercial, to be stored. An application for or including an open parking lot shall be accompanied by a plan exhibiting the following:

1. Dimensions of the lot and its location in relation to adjoining streets; and
2. Any structure(s) existing or to be erected on the plot; and
3. The relative elevations of the parking area, curbs and adjoining yards or courts; and
4. Structures, retaining walls, and open spaces on adjoining premises; and
5. Retaining walls to be built; and
6. Location and dimensions of curb cuts, driveways, and enclosures; and
7. Drainage diagram; and
8. Specification of surfacing material; and
9. Parking stall layout with dimensions; and
10. Analysis exhibiting compliance with the *New York City Zoning Resolution*; and
11. Other information as may be requested by the commissioner.

A copy of the plan or diagram approved by the department shall be kept on the premises. Certified, reduced size, legible copies may be used for this purpose. When an attendant's shelter is provided on the parking lot, the Certificate of Occupancy issued shall be posted and maintained under glass in the shelter.

**406.7.4 Locations prohibited.** All vehicular activities associated with the operation of open parking lots shall be entirely within the property lines of the premises. Vehicles shall not be permitted to encroach upon the sidewalks. No motor vehicle may be stored or parked in any location where it would obstruct a required window or required exit of any adjacent building.

**406.7.5 Surfacing.** All driveways, parking stalls, and open spaces used for the parking or storage of motor vehicles shall be surfaced with concrete asphalt, or equivalent durable, dustless material.

**406.7.5.1 Drainage.** Open parking lots shall be graded and maintained such that no drainage will flow onto abutting sidewalks and adjoining properties.

**406.7.5.2 Nonporous surfaces.** Where the surface paving of an open parking lot is nonporous, such lot shall be drained as required by the *New York City Plumbing Code*.

**406.7.5.3 Resurfacing.** Resurfacing of existing open parking lots shall comply with this section.

**406.7.6 Curb cuts.** For the purpose of this section, a curb cut shall include all splays when determining the total length of cut curb. Unless otherwise required by the *New York City Zoning Resolution*, all curb cuts shall comply with the following requirements:

1. The aggregate length of curb cuts shall not exceed 60 percent of any street frontage 100 feet (30480 mm) or less in length. No single curb cut shall exceed 30 feet (9144 mm) in length, and there shall not be more than two curb cuts on any street frontage 100 feet (30 480 mm) or less in length. The minimum distance between two curb cuts shall be 5 feet (1524 mm).
2. For each 50 feet (15 240 mm) of street frontage length over 100 feet (30 480 mm), an additional curb cut no greater than 30 feet (9144 mm) in length may be permitted.
3. No curb cut shall commence within 8 feet (2438 mm) of a side lot line, except that on corner lots and lots with street frontage length of 50 feet (15 240 mm) or less, the curb cut may commence 30 inches (762 mm) from the side lot line.
4. No curb cut, including splays, shall be less than 10 feet (3048 mm) in length.

**406.7.7 Driveways.** Driveways serving passenger vehicles shall be a minimum of 8 feet (2438 mm) in width and shall not exceed the length of the curb cut, not including the lengths of the splays. For all other motor vehicles, the minimum width of driveways shall be 10 feet (3048 mm). Portions of the driveway located between the curb line and the lot line shall be paved in accordance with the requirements of the Department of Transportation for the construction of sidewalks.

**406.7.8 Curbs and bumpers.** Open parking lots shall be completely separated from adjoining premises and public sidewalks by curbs or bumpers of concrete, masonry, steel, heavy timber, or other similar and equally substantial materials, and shall be securely anchored so as to stop motor vehicles. Curbs and bumpers shall be at least 8 inches (203 mm) high and 8 inches (203 mm) wide.

**406.7.8.1 Openings.** Openings in required perimeter curbs and bumpers shall be permitted only for drainage, for motor vehicle entrances and exits, and for pedestrian entrances and exits. The width of an opening for motor vehicle access shall not exceed the length of the curb cut, not including the lengths of the splays. When an opening for pedestrian access is adjacent to a motor vehicle access opening, the two open-

ings shall be separated by a permanent and substantial post. In no case shall any pedestrian entrance or exit exceed 5 feet (1524 mm) in width.

**406.7.9 Accessory uses and occupancies.** Parking lot offices, attendant shelters, storage facilities, and similar structures used in conjunction with open parking lots may be provided as an accessory use and shall comply with the applicable code provisions. Such accessory structures may be constructed of combustible materials subject to the limitations of Section D105.1 of Appendix D.

**406.7.9.1 Motor fuel-dispensing facilities.** Motor fuel-dispensing facilities, accessory to open parking lots, shall comply with the requirements of Section 406.5 of this code and the *New York City Fire Code* and Section 406.5 of this code. Motor fuel pumps shall be located at least 30 feet (9144 mm) from any parking space or interior lot line.

**406.7.10 Special provisions applicable to large open parking lots.** Open parking lots storing 10 or more motor vehicles shall also be subject to the special provisions of this section.

**406.7.10.1 Curbs and bumpers.** Bumpers shall be situated not less than 1 foot (305 mm) from the perimeter edge of the open parking lot where vehicles are parked parallel to such perimeter edge, and not less than 4 feet (1219 mm) from the perimeter edge where vehicles are parked perpendicular to such perimeter edge. Openings shall be limited as provided for in Section 406.7.8.1.

**Exception:** A steel guardrail or other substantial barrier designed in accordance with the provisions of Section 1607.7.3, that will prevent any part of a vehicle from extending across a property line, may be accepted in lieu of bumpers.

**406.7.10.2 Screen enclosures.** Open parking lots shall provide a perimeter screen enclosure as per this section unless otherwise required by the *New York City Zoning Resolution*. Such screen enclosure may be constructed as a masonry wall, woven wire fence, iron picket fence, or uniformly painted fence of fire-resistant material at least 4 feet (1219 mm) high, but not more than 8 feet (2438 mm) above finished grade, subject to the limitations of Section 3111. Such enclosures shall completely separate the lot from adjoining premises and public sidewalks. Openings shall be limited as provided for in Section 406.7.8.1.

**Exception:** Screening shall not be required for any portion of the lot adjacent to an existing wall located at the lot line.

**406.7.10.3 Illumination.** Open parking lots operating between 6 p.m. and 6 a.m. shall be adequately illuminated to a minimum of 1 foot-candle (10.8 lux) measured at grade level, distributed over the entire area. Illumination provided with reflectors or floodlights shall be arranged such that the illumination is directed downward and away from adjacent premises.

**406.7.10.4 Fire-fighter aisles.** In any open parking lot, one or more aisles, at least 24 inches (610 mm) in width, shall be provided to permit access by fire fighting personnel to all parts of the garage or lot. There shall not be more than three rows of parked motor vehicles between aisles.

**406.7.11 Electric vehicle charging stations.** Open parking lots shall be capable of supporting electric vehicle charging stations in accordance with this section. A minimum of 20 percent of the parking spaces in an open parking lot shall be equipped with electrical raceway capable of providing a minimum supply of 11.5 kVA to electrical vehicle supply equipment† (EVSE) from an electrical supply panel. The raceways shall be no smaller than 1 inch (25 mm)†. The electrical supply panel serving such parking spaces must have at least 3.1 kW of available capacity for each stall connected to it with raceway. Such raceway and all components and work appurtenant thereto shall be in accordance with the *New York City Electrical Code*.

#### Exceptions:

1. The provisions of this section shall not apply to open parking lots for buildings of Occupancy‡ Group‡ M (Mercantile).
2. The commissioner may waive compliance with this section if the commissioner determines that the open parking lot is a temporary facility that will be in service no longer than 3 years.
3. The provisions of this section shall not apply to open parking lots for buildings in which not less than fifty percent of the residential units are for households earning up to sixty percent of the area median income as determined by the United States Department of Housing and Urban Development.

## SECTION BC 407 GROUP I-2

**407.1 General.** Occupancies in Group I-2 shall comply with the provisions of Sections 407.1 through 407.9 and other applicable provisions of this code.

**407.2 Corridors.** Corridors in occupancies in Group I-2 shall be continuous to the exits and separated from other areas in accordance with Section 407.3 except spaces conforming to Sections 407.2.1 through 407.2.4.

**407.2.1 Waiting and similar areas.** Waiting areas and similar spaces constructed as required for corridors shall be permitted to be open to a corridor, only where all of the following criteria are met:

1. The spaces are not occupied for patient sleeping units, treatment rooms, hazardous or incidental accessory occupancies in accordance with Section 508.2.
2. The open space is protected by an automatic fire detection system installed in accordance with Section 907.



3. The corridors onto which the spaces open, in the same smoke compartment, are protected by an automatic fire detection system installed in accordance with Section 907, or the smoke compartment in which the spaces are located is equipped throughout with quick-response sprinklers in accordance with Section 903.3.2.
4. The space is arranged so as not to obstruct access to the required exits.

**407.2.2 Nurses' stations.** Spaces for doctors' and nurses' charting, communications and related clerical areas shall be permitted to be open to the corridor, when such spaces are constructed as required for corridors.

**407.2.3 Mental health treatment areas.** Areas wherein mental health patients who are not capable of self-preservation are housed, or group meeting or multipurpose therapeutic spaces other than incidental accessory occupancies in accordance with Section 509, under continuous supervision by facility staff, shall be permitted to be open to the corridor, where the following criteria are met:

1. Each area does not exceed 1,500 square feet (140 m<sup>2</sup>).
2. The area is located to permit supervision by the facility staff.
3. The area is arranged so as not to obstruct any access to the required exits.
4. The area is equipped with an automatic fire detection system installed in accordance with Section 907.2.
5. Not more than one such space is permitted in any one smoke compartment.
6. The walls and ceilings of the space are constructed as required for corridors.

**407.2.4 Gift shops.** Gift shops and associated storage that are less than 500 square feet (46 m<sup>2</sup>) in area shall be permitted to be open to the corridor where such spaces are constructed as required for corridors.

**407.3 Corridor walls.** Corridor walls shall be constructed as smoke partitions in accordance with Section 711.

**407.3.1 Corridor doors.** Corridor doors, other than those in a wall required to be rated by Section 509.4 or for the enclosure of a vertical opening or an exit, shall not have a required fire protection rating and shall not be required to be equipped with self-closing or automatic-closing devices, but shall provide an effective barrier to limit the transfer of smoke and shall be equipped with positive latching. Roller latches are not permitted. Other doors shall conform to Section 715.4.

**407.3.2 Locking devices.** Locking devices that restrict access to the patient room from the corridor, and that are operable only by staff from the corridor side, shall not restrict the means of egress from the patient room except for patient rooms in mental health facilities.

**407.4 Smoke barriers.** Smoke barriers shall be provided to subdivide every story used by patients for sleeping or treatment and to divide other stories with an occupant load of 50 or more persons, into at least two smoke compartments. Such stories shall be divided into smoke compartments with an area of not more than 22,500 square feet (2090 m<sup>2</sup>) and the travel distance from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be in accordance with Section 710.

**407.4.1 Refuge area.** At least 30 net square feet (2.8 m<sup>2</sup>) per patient shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge or dining areas and other low-hazard areas on each side of each smoke barrier. On floors not housing patients confined to a bed or litter, at least 6 net square feet (0.56 m<sup>2</sup>) per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining smoke compartments.

**407.4.2 Independent egress.** A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originated.

**407.4.3 Horizontal assemblies.** Horizontal assemblies supporting smoke barriers required by this section shall be designed to resist the movement of smoke and shall comply with Section 712.9.

**407.5 Automatic sprinkler system.** Smoke compartments containing patient sleeping units shall be equipped throughout with an automatic fire sprinkler system in accordance with Section 903.3.1.1. The smoke compartments shall be equipped with approved quick-response or residential sprinklers in accordance with Section 903.3.2.

**407.6† Fire alarm system.** A fire alarm system shall be provided in accordance with Section 907.2.6.

**407.7 Automatic fire detection.** Corridors in nursing homes (both intermediate-care and skilled nursing facilities), detoxification facilities and spaces permitted to be open to corridors by Section 407.2 shall be equipped with an automatic fire detection system installed in accordance with Section 907. Hospitals shall be equipped with smoke detection as required in Section 407.2.

#### Exceptions:

1. Corridor smoke detection is not required where patient sleeping units are provided with smoke detectors that comply with UL 268. Such detectors shall provide a visual display on the corridor side of each patient sleeping unit and an audible and visual alarm at the nursing station attending each unit.
2. Corridor smoke detection is not required where patient sleeping unit doors are equipped with automatic door-closing devices with integral smoke detectors on the unit sides installed in accordance with their listing, provided that the integral detectors perform the required alerting function.

**407.8 Secured yards.** Grounds are permitted to be fenced and gates therein are permitted to be equipped with locks, provided that safe dispersal areas having 30 net square feet (2.8 m<sup>2</sup>) for bed and litter patients and 6 net square feet (0.56 m<sup>2</sup>) for ambulatory patients and other occupants are located between the building and the fence. Such provided safe dispersal areas shall not be located less than 50 feet (15 240 mm) from the building they serve.

**407.9 Hyperbaric facilities.** Hyperbaric facilities in Group I-2 occupancies shall meet the requirements contained in Chapter 20 of NFPA 99.

## SECTION BC 408 GROUP I-3

**408.1 General.** Occupancies in Group I-3 shall comply with the provisions of Sections 408.1 through 408.10 and other applicable provisions of this code (see Section 308.4).

**408.1.1 Definition.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**CELL.** A room within a housing unit in a detention or correctional facility used to confine inmates or prisoners.

**CELL TIER.** Levels of cells vertically stacked above one another within a housing unit.

**HOUSING UNIT.** A dormitory or a group of cells with a common dayroom in Group I-3.

**SALLYPORT.** A security vestibule with two or more doors or gates where the intended purpose is to prevent continuous and unobstructed passage by allowing the release of only one door or gate at a time.

**408.1.2 Occupancy conditions.** Buildings of Group I-3 shall be classified as one of the occupancy conditions indicated in Sections 408.1.2.1 through 408.1.2.5.

**408.1.2.1 Condition 1.** This occupancy condition shall include buildings in which free movement is allowed from sleeping areas, and other spaces where access or occupancy is permitted, to the exterior via means of egress without restraint. A Condition 1 facility is permitted to be constructed as Group R.

**408.1.2.2 Condition 2.** This occupancy condition shall include buildings in which free movement is allowed from sleeping areas and any other occupied smoke compartment to one or more other smoke compartments. Egress to the exterior is impeded by locked exits and exit is not under an occupant's control.

**408.1.2.3 Condition 3.** This occupancy condition shall include buildings in which free movement is allowed within individual smoke compartments, such as within a residential unit comprised of individual sleeping unit(s) and/or group activity spaces, where egress is impeded by remote-controlled door release, leading by means of egress from such a smoke compartment to another smoke compartment.

**408.1.2.4 Condition 4.** This occupancy condition shall include buildings in which free movement is restricted

from an occupied space. Remote-controlled release is provided to permit movement from sleeping units, activity spaces and other occupied areas within the smoke compartment to other smoke compartments and egress to the outside is impeded by locked exit and remote door release.

**408.1.2.5 Condition 5.** This occupancy condition shall include buildings in which free movement is restricted from an occupied space. Staff-controlled manual release is provided to permit movement from sleeping units, activity spaces and other occupied areas within the smoke compartment to other smoke compartments.

**408.2 Other occupancies.** Buildings or portions of buildings in Group I-3 occupancies where security operations necessitate the locking of required means of egress shall be permitted to be classified as a different occupancy. Occupancies classified as other than Group I-3 shall meet the applicable requirements of this code for that occupancy provided provisions shall be made for the release of occupants at all times. Means of egress from detention and correctional occupancies that traverse other use areas shall, as a minimum, conform to requirements for detention and correctional occupancies.

**Exception:** It is permissible to exit through a horizontal exit into other contiguous occupancies that do not conform to detention and correctional occupancy egress provisions but that do comply with requirements set forth in the appropriate occupancy, as long as the occupancy is not a Group H use.

**408.3 Means of egress.** Except as modified or as provided for in this section, the provisions of Chapter 10 shall apply.

**408.3.1 Door width.** Doors to resident sleeping units shall have a clear width of not less than 28 inches (711 mm).

**408.3.2 Sliding doors.** Where doors in a means of egress are of the horizontal-sliding type, the force to slide the door to its fully open position shall not exceed 50 pounds (220 N) with a perpendicular force against the door of 50 pounds (220 N).

**408.3.3 Guard tower doors.** A hatch or trap door not less than 16 square feet (610 m<sup>2</sup>) in area through the floor and having minimum dimensions of not less than 2 feet (610 mm) in any direction shall be permitted to be used as a portion of the means of egress from guard towers.

**408.3.4 Spiral stairways.** Spiral stairways that conform to the requirements of Section 1009.9 are permitted for access to and between staff locations.

**408.3.5 Ship ladders.** Ship ladders shall be permitted for egress from control rooms or elevated facility observation rooms in accordance with Section 1009.11.

**408.3.6 Exit discharge.** Exits are permitted to discharge into a fenced or walled courtyard. Enclosed yards or courts shall be of a size to accommodate all occupants, a minimum of 50 feet (15 240 mm) from the building with a net area of 15 square feet (1.4 m<sup>2</sup>) per person.



**408.3.7 Sallyports.** A sallyport shall be permitted in a means of egress where there are provisions for continuous and unobstructed passage through the sallyport during an emergency egress condition.

**408.3.8 Exit enclosures.** One of the required exit enclosures in each building shall be permitted to have glazing installed in doors and interior walls at each landing level providing access to the enclosure, provided that the following conditions are met:

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1. The vertical exit enclosure shall not serve more than four floor levels.
  - NYC 2. Exit doors shall not be less than  $\frac{3}{4}$ -hour fire doors complying with Section 715.4.
  3. The total area of glazing at each floor level shall not exceed 5,000 square inches (3 m<sup>2</sup>) and individual panels of glazing shall not exceed 1,296 square inches (0.84 m<sup>2</sup>).
  4. The glazing shall be protected on both sides by an automatic sprinkler system. The sprinkler system shall be designed to wet completely the entire surface of any glazing affected by fire when actuated.
  5. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
  6. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

**408.4 Locks.** Egress doors are permitted to be locked in accordance with the applicable use condition. Doors from a refuge area to the exterior are permitted to be locked with a key in lieu of locking methods described in Section 408.4.1. The keys to unlock the exterior doors shall be available at all times and the locks shall be operable from both sides of the door.

**408.4.1 Remote release.** Remote release of locks on doors in a means of egress shall be provided with reliable means of operation, remote from the resident living areas, to release locks on all required doors. In Occupancy Conditions 3 or 4, the arrangement, accessibility and security of the release mechanism(s) required for egress shall be such that with the minimum available staff at any time, the lock mechanisms are capable of being released within 2 minutes.

**Exception:** Provisions for remote locking and unlocking of occupied rooms in Occupancy Condition 4 are not required provided that not more than 10 locks are necessary to be unlocked in order to move occupants from one smoke compartment to a refuge area within 3 minutes. The opening of necessary locks shall be accomplished with not more than two separate keys.

**408.4.2 Power-operated doors and locks.** Power-operated sliding doors or power-operated locks for swinging doors shall be operable by a manual release mechanism at

the door, and either emergency power or a remote mechanical operating release shall be provided.

**Exception:** Emergency power is not required in facilities with 10 locks or less complying with the exception to Section 408.4.1.

**408.4.3 Redundant operation.** Remote release, mechanically operated sliding doors or remote release, mechanically operated locks shall be provided with a mechanically operated release mechanism at each door, or shall be provided with a redundant remote release control.

**408.4.4 Relock capability.** Doors remotely unlocked under emergency conditions shall not automatically relock when closed unless specific action is taken at the remote location to enable doors to relock.

**408.5 Protection of vertical openings.** Any vertical opening shall be protected by a shaft enclosure in accordance with Section 708, or shall be in accordance with Sections 408.5.1 and 408.5.2.

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**408.5.1 Floor openings.** Openings in floors within a housing unit are permitted without a shaft enclosure provided all of the following conditions are met:

1. The entire normally occupied areas so interconnected are open and unobstructed so as to enable observation of the areas by supervisory personnel;
2. Means of egress capacity is sufficient for all occupants from all interconnected cell tiers and areas;
3. The height difference between the floor levels of the highest and lowest cell tiers shall not exceed 23 feet (7010 mm); and
4. Egress from any portion of the cell tier to an exit or exit access door shall not require travel on more than one additional floor level within the housing unit.

**408.5.2 Shaft openings in communicating floor levels.** Where a floor opening is permitted between communicating floor levels of a housing unit in accordance with Section 408.5.1, plumbing chases serving vertically stacked individual cells contained within the housing unit shall be permitted without a shaft enclosure.

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**408.6 Smoke barrier.** Occupancies in Group I-3 shall have smoke barriers complying with Sections 408.8 and 710 to divide every story occupied by residents for sleeping, or any other story having an occupant load of 50 or more persons, into at least two smoke compartments.

**Exception:** Spaces having direct exit to one of the following, provided that the locking arrangement of the doors involved complies with the requirements for doors at the smoke barrier for the use condition involved:

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1. A public way.
2. A building separated from the resident housing area by a 2-hour fire-resistance-rated assembly or 50 feet (15 240 mm) of open space.
3. A secured yard or court having a holding space 50 feet (15 240 mm) from the housing area that pro-

vides 6 square feet (0.56 m<sup>2</sup>) or more of refuge area per occupant, including residents, staff and visitors.

**408.6.1 Smoke compartments.** The maximum number of residents in any smoke compartment shall be 200. The travel distance to a door in a smoke barrier from any room door required as exit access shall not exceed 150 feet (45 720 mm). The travel distance to a door in a smoke barrier from any point in a room shall not exceed 200 feet (60 960 mm).

**408.6.2 Refuge area.** At least 6 net square feet (0.56 m<sup>2</sup>) per occupant shall be provided on each side of each smoke barrier for the total number of occupants in adjoining smoke compartments. This space shall be readily available wherever the occupants are moved across the smoke barrier in a fire emergency.

**408.6.3 Independent egress.** A means of egress shall be provided from each smoke compartment created by smoke barriers without having to return through the smoke compartment from which means of egress originates.

**408.7 Security glazing.** In occupancies in Group I-3, windows and doors in 1-hour fire barriers constructed in accordance with Section 707, fire partitions constructed in accordance with Section 709 and smoke barriers constructed in accordance with Section 710 shall be permitted to have security glazing installed provided that the following conditions are met. Such glazing shall be subject to the requirements in Chapter 24.

1. Individual panels of glazing shall not exceed 1,296 square inches (0.84 m<sup>2</sup>).
2. The glazing shall be protected on both sides by an automatic sprinkler system. The sprinkler system shall be designed to, when actuated, wet completely the entire surface of any glazing affected by fire.
3. The glazing shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler system operates.
4. Obstructions, such as curtain rods, drapery traverse rods, curtains, drapes or similar materials shall not be installed between the automatic sprinklers and the glazing.

**408.8 Subdivision of resident housing areas.** Sleeping areas and any contiguous day room, group activity space or other common spaces where residents are housed shall be separated from other spaces in accordance with Sections 408.8.1 through 408.8.4.

**408.8.1 Occupancy Conditions 3 and 4.** Each sleeping area in Occupancy Conditions 3 and 4 shall be separated from the adjacent common spaces by a smoke-tight partition where the travel distance from the sleeping area through the common space to the exit access corridor exceeds 50 feet (15 240 mm).

**408.8.2 Occupancy Condition 5.** Each sleeping area in Occupancy Condition 5 shall be separated from adjacent sleeping areas, corridors and common spaces by a smoke-

tight partition. Additionally, common spaces shall be separated from the corridor by a smoke-tight partition.

**408.8.3 Openings in room face.** The aggregate area of openings in a solid sleeping room face in Occupancy Conditions 2, 3, 4 and 5 shall not exceed 120 square inches (77 419 mm<sup>2</sup>). The aggregate area shall include all openings including door undercuts, food passes and grilles. Openings shall be not more than 36 inches (914 mm) above the floor. In Occupancy Condition 5, the openings shall be closeable from the room side.

**408.8.4 Smoke-tight doors.** Doors in openings in partitions required to be smoke tight by Section 408.8 shall be substantial doors, of construction that will resist the passage of smoke. Latches and door closures are not required on cell doors.

**408.9 Windowless buildings.** For the purposes of this section, a windowless building or portion of a building is one with nonopenable windows, windows not readily breakable or without windows. Windowless buildings shall be provided with an engineered smoke control system to provide a tenable environment for exiting from the smoke compartment in the area of fire origin in accordance with Section 909 for each windowless smoke compartment.

**408.10 Fire alarm system.** A fire alarm system shall be provided in accordance with Section 907.2.6.3.

## SECTION BC 409 MOTION PICTURE PROJECTION ROOMS

**409.1 General.** The provisions of Sections 409.1 through 409.5 shall apply to rooms in which ribbon-type cellulose acetate or other safety film is utilized in conjunction with electric arc, xenon or other light-source projection equipment that develops hazardous gases, dust or radiation. The projection, use or storage of film having a nitrocellulose base (commonly known as nitrate film) shall not be permitted except under conditions specified in special permits when issued by the Fire Department. Safety film meeting the specification and test standards of NFPA 40 may be projected, used or stored.

**409.1.1 Projection room required.** Every motion picture machine projecting film as mentioned within the scope of this section shall be enclosed in a projection room. Appurtenant electrical equipment, such as rheostats, transformers and generators, shall be within the projection room or in an adjacent room of equivalent construction.

**409.2 Construction of projection rooms.** Every projection room shall be of permanent construction consistent with the construction requirements for the type of building in which the projection room is located. Openings are not required to be protected. The room shall have a floor area of not less than 80 square feet (7.44 m<sup>2</sup>) for a single machine and at least 40 square feet (3.7 m<sup>2</sup>) for each additional machine. Each motion picture projector, floodlight, spotlight or similar piece of equipment shall have a clear working space of not less than 30 inches by 30 inches (762 mm by 762 mm) on each side and at the rear thereof, but only one such space

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shall be required between two adjacent projectors. The projection room and the rooms appurtenant thereto shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). The aggregate of openings for projection equipment shall not exceed 25 percent of the area of the wall between the projection room and the auditorium. Openings shall be provided with glass or other approved material, so as to close completely the opening.

**409.3 Projection room and equipment ventilation.** Ventilation shall be provided in accordance with the *New York City Mechanical Code*.

**409.3.1 Supply air.** Each projection room shall be provided with adequate air supply inlets so arranged as to provide well-distributed air throughout the room. Air inlet ducts shall provide an amount of air equivalent to the amount of air being exhausted by projection equipment. Air is permitted to be taken from the outside; from adjacent spaces within the building, provided the volume and infiltration rate is sufficient; or from the building air-conditioning system, provided it is so arranged as to provide sufficient air when other systems are not in operation.

**409.3.2 Exhaust air.** Projection rooms are permitted to be exhausted through the lamp exhaust system. The lamp exhaust system shall be positively interconnected with the lamp so that the lamp will not operate unless there is the required airflow. Exhaust air ducts shall terminate at the exterior of the building in such a location that the exhaust air cannot be readily recirculated into any air supply system. The projection room ventilation system is permitted to also serve appurtenant rooms, such as the generator and rewind rooms.

**409.3.3 Projection machines.** Each projection machine shall be provided with an exhaust duct that will draw air from each lamp and exhaust it directly to the outside of the building. The lamp exhaust is permitted to serve to exhaust air from the projection room to provide room air circulation. Such ducts shall be of rigid materials, except for a flexible connector approved for the purpose. The projection lamp or projection room exhaust system, or both, is permitted to be combined but shall not be interconnected with any other exhaust or return system, or both, within the building.

**409.4 Lighting control.** Provisions shall be made for control of the auditorium lighting and the means of egress lighting systems of theaters from inside the projection room and from at least one other convenient point in the building.

**409.5 Miscellaneous equipment.** Each projection room shall be provided with rewind and film storage facilities.

## SECTION BC 410 STAGES AND PLATFORMS

**410.1 Applicability.** The provisions of Sections 410.1 through 410.10 shall apply to all parts of buildings and structures that contain stages or platforms and similar appurtenances as herein defined.

**410.2 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein.

**FLY GALLERY.** A raised floor area above a stage from which the movement of scenery and operation of other stage effects are controlled.

**GRIDIRON.** The structural framing over a stage supporting equipment for hanging or flying scenery and other stage effects.

**PINRAIL.** A rail on or above a stage through which belaying pins are inserted and to which lines are fastened.

**PLATFORM.** A raised area within a building used for worship, the presentation of music, plays or other entertainment; the head table for special guests; the raised area for lecturers and speakers; boxing and wrestling rings; theater-in-the-round stages; and similar purposes wherein there are no overhead hanging curtains, drops, scenery or stage effects other than lighting and sound. A temporary platform is one installed for not more than 30 days.

**PROSCENIUM WALL.** The wall that separates the stage from the auditorium or assembly seating area.

**STAGE.** A space within a building utilized for entertainment or presentations, which includes overhead hanging curtains, drops, scenery or stage effects other than lighting and sound.

**410.3 Stages.** Stage construction shall comply with Sections 410.3.1 through 410.3.7.

**410.3.1 Stage construction.** Stage floors shall be constructed of materials as required for floors for the type of construction of the building in which such stages are located. Where areas below the stage are used for other occupancies, such stage floor shall be constructed in accordance with the requirements for separated occupancies as per Chapter 5.

### Exceptions:

1. Stages of Type IIB or IV construction with a nominal 2-inch (51 mm) wood deck, provided that the stage is separated from other areas in accordance with Section 410.3.4.
2. In all types of construction, the finished floor shall be constructed of wood or approved non-combustible materials. Openings through stage floors shall be equipped with tight-fitting, solid wood trap doors with approved safety locks. The room or space below the stage into which the traps or lifts open shall be completely enclosed by construction having at least the fire-resistance rating required for the stage floor, and such room or space shall not be used as a workshop or storage area. Storage shall not be deemed to include the location in this area of scenery or scenic elements used during a performance. However, no combustible material that has a flame spread rating greater than 25 or that has not been rendered flameproof in accordance with the rules of the



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**410.3.7.2 Smoke control.** Smoke control in accordance with Section 909 shall be provided to maintain the smoke layer interface not less than 6 feet (1829 mm) above the highest level of the assembly seating or above the top of the proscenium opening where a proscenium wall is provided in compliance with Section 410.3.4.

**4 Platform construction.** Permanent platforms shall be constructed of materials as required for the type of construction of the building in which the permanent platform is used. Permanent platforms are permitted to be constructed in accordance with the following:

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**410.4.1 Temporary platforms.** Platforms installed for a period of not more than 30 days are permitted to be constructed of any materials permitted by the code. The space between the floor and the platform above shall only be used for plumbing and electrical wiring to platform equipment.

**410.5 Dressing and appurtenant rooms.** Dressing and appurtenant rooms shall comply with Sections 410.5.1 through 410.5.4.

**410.5.1 Separation from stage.** The stage shall be separated from dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the stage and other parts of the building by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The minimum fire-resistance rating shall be 2 hours for stage heights greater than 50 feet (15 240 mm) and 1 hour for stage heights of 50 feet (15 240 mm) or less.

**410.5.2 Separation from each other.** Dressing rooms, scene docks, property rooms, workshops, storerooms and compartments appurtenant to the stage shall be separated from each other by not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**410.5.3 Stage exits.** At least one approved means of egress shall be provided from each side of the stage; and from each side of the space under the stage. At least one means of escape shall be provided from each fly gallery and from the gridiron. A steel ladder, alternating tread device or spiral stairway is permitted to be provided from the gridiron to a scuttle in the stage roof.

**410.6 Automatic sprinkler system.** Stages shall be equipped with an automatic fire-extinguishing system in accordance with Chapter 9. Sprinklers shall be installed under the roof and gridiron, and under all catwalks and galleries over the stage. Sprinklers shall be installed in dressing rooms, performer lounges, shops and storerooms accessory to such stages:

1. Automatic sprinklers shall be placed above all rigging lofts; and above all stage areas, other than those portions of stage areas specifically designated on approved plans as performing areas that do not have rigging lofts above and that are not at any time used for storage purposes. Sprinklers above rigging lofts shall be located so that no gridiron or other obstruction intervenes between the sprinkler heads and the scenery or scenic elements.
2. When openings are provided in the stage floor for stage lifts, trap doors or stairs, sprinklers spaced 5 feet (1524 mm) on centers shall be provided around the opening at the ceiling below the stage, and baffles at least 12 inches (305 mm) in depth shall be installed around the perimeter of the opening.
3. All valves controlling sprinkler supplies shall be provided with tamper switches wired to an annunciator panel located at the voice/alarm communication system required by Section 410.8.

4. The operation of any section of the sprinkler system and the deluge system shall activate the emergency ventilating equipment required in Section 410.3.7 and shall be provided with central station supervision in addition to the required local alarm.
5. The water flow alarm, tamper switches and deluge system equipment shall be provided with central station supervision in addition to the required local alarm.

**Exceptions:**

1. Sprinklers are not required under stage areas less than 4 feet (1219 mm) in clear height utilized exclusively for storage of tables and chairs, provided the concealed space is separated from the adjacent spaces by not less than  $\frac{5}{8}$ -inch (15.9 mm) Type X gypsum board.
2. Sprinklers are not required within portable orchestra enclosures on stages.

**410.7 Standpipes.** Standpipe systems shall be provided in accordance with Section 905.

**410.8 Voice/alarm communication system.** Stages shall be provided with a voice/alarm communication system in accordance with Section 907.2.1.1.

**410.9 Construction in seating areas.**

**410.9.1 Scenery and scenic elements in seating areas.** Scenery or scenic elements may be placed in seating sections if such elements:

1. Are noncombustible, or of materials that have been rendered flameproof in accordance with the rules of the fire commissioner, or have a flame spread rating of 25 or less.
2. Are adequately braced or secured.
3. Do not obstruct the required visibility of, or paths of travel to, exit openings.

**410.9.2 Platforms or runways in seating areas.** Platforms or runways for performances, to accommodate the operation of cameras, electronic equipment, or motion picture projection machines not using carbon-arc or other light source that emits a gaseous discharge may be constructed in seating sections, provided such platforms or runways comply with the requirements of Section 410.4, except Item 1 and Section 410.8.

**410.10 Stage lighting.** Stage lights shall be placed such that they will not develop temperatures on the surface of any material that will cause that material to ignite, or smoke, or cause its flameproofing to deteriorate.

## SECTION BC 411 SPECIAL AMUSEMENT BUILDINGS

**411.1 General.** Special amusement buildings having an occupant load of 75 or more shall comply with the requirements for the appropriate Group A occupancy and Sections 411.1 through 411.8. Amusement buildings having an occupant load of less than 75 shall comply with the requirements for a Group B occupancy and Sections 411.1 through 411.8.



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**Exception:** Amusement buildings or portions thereof that are without walls or a roof and constructed to prevent the accumulation of smoke. All decorative material shall be noncombustible or composed of flame-retardant fabric.

**411.2 Definition.** The following word and term shall, for the purpose of this section and as used elsewhere in this code, have the meaning shown herein.

**SPECIAL AMUSEMENT BUILDING.** A special amusement building is any temporary or permanent building or portion thereof that is occupied for amusement, entertainment or educational purposes and that contains a device or system that conveys passengers or provides a walkway along, around or over a course in any direction so arranged that the means of egress path is not readily apparent due to visual or audio distractions or is intentionally confounded or is not readily available because of the nature of the attraction or mode of conveyance through the building or structure.

**411.3 Automatic fire detection.** Special amusement buildings shall be equipped with an automatic fire detection system, in accordance with Section 907.

**411.4 Automatic sprinkler system.** Special amusement buildings shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. Where the special amusement building is temporary, the sprinkler water supply shall be of an approved temporary means.

**NYC Exception:** Automatic fire sprinklers are not required where the total floor area of a temporary special amusement building is less than 1,000 square feet (93 m<sup>2</sup>) and the travel distance from any point to an exit is less than 50 feet (15 240 mm).

**411.5 Alarm.** Actuation of a single smoke detector, the automatic sprinkler system or other automatic fire detection device shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated including the capability of manual initiation of requirements in Section 907.2.12.2.

**411.6 Emergency voice/alarm communications system.** An emergency voice/alarm communications system shall be provided in accordance with Sections 907.2.12.3 and 907.5.2.2, which is also permitted to serve as a public address system and shall be audible throughout the entire special amusement building.

**NYC 411.7 Exit marking.** Exit signs shall be installed at the required exit or exit access doorways of amusement buildings in accordance with this section and Section 1011. Approved directional exit markings listed in accordance with UL 1994, shall also be provided. Where mirrors, mazes or other designs are utilized that disguise the path of egress travel such that they are not apparent, approved low-level exit signs that comply with Section 1011.4 and directional path markings shall be provided and located not more than 8 inches (203 mm) above the walking surface and on or near the path of egress travel. Such markings shall become visible

in an emergency. The directional exit marking shall be activated by the automatic fire detection system and the automatic sprinkler system in accordance with Section 907.2.12.2.

**411.8 Interior finish.** The interior finish shall be Class A in accordance with Section 803.1.



## SECTION BC 412 AIRCRAFT-RELATED OCCUPANCIES

**412.1 General.** Aircraft-related occupancies shall comply with Sections 412.1 through 412.7 and the *New York City Fire Code*.

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**412.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**FIXED BASE OPERATOR (FBO).** A commercial business granted the right by the airport sponsor to operate on an airport and provide aeronautical services, such as fueling, hangaring, tie-down and parking, aircraft rental, aircraft maintenance and flight instruction.

**HELIPORT.** An area of land or water or a structural surface that is used, or intended for the use, for the landing and taking off of helicopters, and any appurtenant areas that are used, or intended for use, for heliport buildings or other heliport facilities.

**HELISTOP.** The same as “heliport,” except that no fueling, defueling, maintenance, repairs or storage of helicopters is permitted.

**RESIDENTIAL AIRCRAFT HANGAR.** An accessory building less than 2,000 square feet (186 m<sup>2</sup>) and 20 feet (6096 mm) in building height constructed on a one- or two-family property where aircraft are stored. Such use will be considered as a residential accessory use incidental to the dwelling.

**TRANSIENT AIRCRAFT.** Aircraft based at another location and at the transient location for not more than 90 days.

### 412.3 Airport traffic control towers.

**412.3.1 General.** The provisions of Sections 412.3.1 through 412.3.6 shall apply to airport traffic control towers not exceeding 1,500 square feet (140 m<sup>2</sup>) per floor occupied only for the following uses:

1. Airport traffic control cab.
2. Electrical and mechanical equipment rooms.
3. Airport terminal radar and electronics rooms.
4. Office spaces incidental to the tower operation.
5. Lounges for employees, including sanitary facilities.

**412.3.2 Type of construction.** Airport traffic control towers shall be constructed to comply with the height and area limitations of Table 412.3.2.

**TABLE 412.3.2**  
**HEIGHT AND AREA LIMITATIONS FOR AIRPORT**  
**TRAFFIC CONTROL TOWERS**

TYPE OF CONSTRUCTION	HEIGHT <sup>a</sup> (feet)	MAXIMUM AREA (square feet)
IA	Unlimited	1,500
IB	240	1,500
IIA	100	1,500
IIB	85	1,500
IIIA	65	1,500

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

a. Height to be measured from grade plane to cab floor.

**412.3.3 Egress.** A minimum of one exit stairway shall be permitted for airport traffic control towers of any height provided that the occupant load per floor does not exceed 15. The stairway shall conform to the requirements of Section 1009. The stairway shall be separated from elevators by a minimum distance of one-half of the diagonal of the area served measured in a straight line. The exit stairway and elevator hoistway are permitted to be located in the same shaft enclosure, provided they are separated from each other by a 4-hour fire barrier having no openings. Such stairway shall be pressurized to a minimum of 0.15 inch of water column (43 Pa) and a maximum of 0.35 inch of water column (101 Pa) in the shaft relative to the building with stairway doors closed. Stairways need not extend to the roof as specified in Section 1009.13. The provisions of Section 403 do not apply.

**Exception:** Smokeproof enclosures as set forth in Section 1022.9 are not required where required stairways are pressurized.

**412.3.4 Automatic fire detection systems.** Airport traffic control towers shall be provided with an automatic fire detection system installed in accordance with Section 907.2.

**412.3.5 Standby power.** A standby power system that conforms to Chapter 27 shall be provided in airport traffic control towers more than 65 feet (19 812 mm) in height. Power shall be provided to the following equipment:

1. Pressurization equipment, mechanical equipment and lighting.
2. Elevator operating equipment.
3. Fire alarm and smoke detection systems.

**412.3.6 Accessibility.** Airport traffic control towers need not be accessible as specified in the provisions of Chapter 11.

**412.4 Aircraft hangars.** Aircraft hangars shall be in accordance with Sections 412.4.1 through 412.4.6.

**412.4.1 Exterior walls.** Exterior walls located less than 30 feet (9144 mm) from lot lines or a public way shall have a fire-resistance rating not less than 2 hours.

**412.4.2 Basements.** Where hangars have basements, floors over basements shall be of Type IA construction and shall be made tight against seepage of water, oil or

vapors. There shall be no opening or communication between basements and the hangar. Access to basements shall be from outside only.

**412.4.3 Floor surface.** Floors shall be graded and drained to prevent water or fuel from remaining on the floor. Floor drains shall discharge through an oil separator to the sewer or to an outside vented sump.

**Exception:** Aircraft hangars with individual lease spaces not exceeding 2,000 square feet (186 m<sup>2</sup>) each in which servicing, repairing or washing is not conducted and fuel is not dispensed shall have floors that are graded toward the door, but shall not require a separator.

**412.4.4 Heating equipment.** Heating equipment shall be placed in another room separated by 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. Entrance shall be from the outside or by means of a vestibule providing a two-doorway separation.

**Exceptions:**

1. Unit heaters and vented infrared radiant heating equipment suspended at least 10 feet (3048 mm) above the upper surface of wings or engine enclosures of the highest aircraft that are permitted to be housed in the hangar and at least 8 feet (2438 mm) above the floor in shops, offices and other sections of the hangar communicating with storage or service areas.
2. A single interior door shall be allowed, provided the sources of ignition in the appliances are at least 18 inches (457 mm) above the floor.

**412.4.5 Finishing.** The process of "doping," involving use of a volatile flammable solvent, or of painting, shall be carried on in a separate detached building equipped with automatic fire-extinguishing equipment in accordance with Section 903.

**412.4.6 Fire suppression.** Aircraft hangars shall be provided with a fire suppression system designed in accordance with NFPA 409, based upon the classification for the hangar given in Table 412.4.6.

**Exception:** When a fixed base operator has separate repair facilities on site, Group II hangars operated by a fixed base operator used for storage of transient aircraft only shall have a fire suppression system, but the system is exempt from foam requirements.

**412.4.6.1 Hazardous operations.** Any Group III aircraft hangar according to Table 412.4.6 that contains hazardous operations including, but not limited to, the following shall be provided with a Group I or II fire suppression system in accordance with NFPA 409 as applicable:

1. Doping.
2. Hot work including, but not limited to, welding, torch cutting and torch soldering.
3. Fuel transfer.

**TABLE 412.4.6**  
**HANGAR FIRE SUPPRESSION REQUIREMENTS<sup>a, b, c</sup>**

MAXIMUM SINGLE FIRE AREA, (square feet) <sup>†</sup>	TYPE OF CONSTRUCTION								
	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA <sup>d</sup>	VB <sup>d</sup>
> 40,001	Group I	Group I	Group I	Group I	Group I	Group I	Group I	Group I	Group I
40,000	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II
30,000	Group III	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II
20,000	Group III	Group III	Group II	Group II	Group II	Group II	Group II	Group II	Group II
15,000	Group III	Group III	Group III	Group II	Group III	Group II	Group III	Group II	Group II
12,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group II	Group II
8,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group II
5,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group II	Group II

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For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

- a. Aircraft hangars with a door height greater than 28 feet shall be provided with fire suppression for a Group I hangar regardless of maximum fire area.  
b. Groups shall be as classified in accordance with NFPA 409.  
c. Membrane structures complying with Section 3102 shall be classified as a Group IV hangar.  
d. Construction Types VA and VB are not permitted in Fire Districts. See BC Table 503.

4. Fuel tank repair or maintenance not including defueled tanks in accordance with NFPA 409, inerted tanks or tanks that have never been fueled.
5. Spray finishing operations.
6. Total fuel capacity of all aircraft within the unsprinklered single fire area in excess of 1,600 gallons (6057 L).
7. Total fuel capacity of all aircraft within the maximum single fire area in excess of 7,500 gallons (28 390 L) for a hangar with an automatic sprinkler system in accordance with Section 903.3.1.1.

#### **412.4.6.2 Separation of maximum single fire areas.**

Maximum single fire areas established in accordance with hangar classification and construction type in Table 412.4.6 shall be separated by 2-hour fire walls constructed in accordance with Section 706.

**412.5 Residential aircraft hangars.** Residential aircraft hangars as defined in Section 412.2 shall comply with Sections 412.5.1 through 412.5.2.

**412.5.1 Fire separation.** A hangar shall not be attached to a dwelling unless separated by a fire barrier having a fire-resistance rating of not less than 1 hour. Such separation shall be continuous from the foundation to the underside of the roof and unpierced except for doors leading to the dwelling unit. Doors into the dwelling unit must be equipped with self-closing devices and conform to the requirements of Section 715 with at least a 4-inch (102 mm) noncombustible raised sill. Openings from a hangar directly into a room used for sleeping purposes shall not be permitted.

**412.5.2 Egress.** A hangar shall provide two means of egress. One of the doors into the dwelling shall be considered as meeting only one of the two means of egress.

**412.5.3 Smoke alarms.** Smoke alarms shall be provided within the hangar in accordance with Section 907.2.11.

**412.5.4 Independent systems.** Electrical, mechanical and plumbing drain, waste and vent (DWV) systems installed within the hangar shall be independent of the systems installed within the dwelling. Building sewer lines shall be permitted to be connected outside the structures.

**Exception:** Smoke detector wiring and feed for electrical subpanels in the hangar.

**412.5.5 Height and area limits.** Residential aircraft hangars shall not exceed 2,000 square feet (186 m<sup>2</sup>) in area and 20 feet (6096 mm) in building height.

**412.6 Aircraft paint hangars.** Aircraft painting operations where flammable liquids are used in excess of the maximum allowable quantities per control area listed in Table 307.7(1) shall be conducted in an aircraft paint hangar that complies with the provisions of Sections 412.6.1 through 412.6.6.

**412.6.1 Occupancy group.** Aircraft paint hangars shall be classified as Group H-2. Aircraft paint hangars shall comply with the applicable requirements of this code and the *New York City Fire Code* for such occupancy.

**412.6.2 Construction.** The aircraft paint hangar shall be of Type I or II construction.

**412.6.3 Operations.** Only those flammable liquids necessary for painting operations shall be permitted in quantities less than the maximum allowable quantities per control area in Table 307.1(1). Spray equipment cleaning operations shall be conducted in a liquid use, dispensing and mixing room.

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**412.6.4 Storage.** Storage of flammable liquids shall be in a liquid storage room.

**412.6.5 Fire suppression.** Aircraft paint hangars shall be provided with fire suppression as required by NFPA 409.

**412.6.6 Ventilation.** Aircraft paint hangars shall be provided with ventilation as required in the *New York City Mechanical Code*.

**412.7 Heliports and helistops.** Heliports and helistops may be erected on buildings or other locations where they are constructed in accordance with Sections 412.7.1 through 412.7.4.

**412.7.1 Size.** The touchdown or landing area for helicopters of less than 3,500 pounds (1588 kg) shall be a minimum of 20 feet (6096 mm) in length and width. The touchdown area shall be surrounded on all sides by a clear area having a minimum average width at roof level of 15 feet (4572 mm) but with no width less than 5 feet (1524 mm).

**412.7.2 Design.** Helicopter landing areas and the supports thereof on the roof of a building shall be noncombustible construction. Landing areas shall be designed to confine any flammable liquid spillage to the landing area itself and provisions shall be made to drain such spillage away from any exit or stairway serving the helicopter landing area or from a structure housing such exit or stairway. For structural design requirements, see Section 1605.4.

**412.7.3 Means of egress.** The means of egress from heliports and helistops shall comply with the provisions of Chapter 10. Landing areas located on buildings or structures shall have two or more means of egress. For landing platforms or roof areas less than 60 feet (18 288 mm) in length, or less than 2,000 square feet (186 m<sup>2</sup>) in area, the second means of egress is permitted to be a fire escape, alternating tread device, or ladder leading to the floor below.

**412.7.4 Rooftop heliports and helistops.** Rooftop heliports and helistops shall comply with NFPA 418 and the *New York City Fire Code*.

## SECTION BC 413 COMBUSTIBLE STORAGE

**413.1 General.** Storage of combustible materials in attics, under-floor spaces, concealed spaces, and below-grade storage rooms shall comply with this section.

**413.2 Attic, under-floor and concealed spaces.** Attic, under-floor and concealed spaces used for storage of combustible materials shall be protected on the storage side as required for 1-hour fire-resistant construction. Openings shall be protected by assemblies that are self-closing and are of noncombustible construction or solid wood core not less than 1<sup>3</sup>/<sub>4</sub> inch (45 mm) in thickness.

### Exceptions:

1. Areas protected by approved automatic sprinkler systems.
2. Group R-3 and U occupancies.

**413.3 High-piled stock or rack storage.** High-piled stock or rack storage in any occupancy group shall comply with the *New York City Fire Code*.

## SECTION BC 414 HAZARDOUS MATERIALS

**414.1 General.** The provisions of Sections 414.1 through 414.7 shall apply to buildings and structures occupied for the manufacturing, processing, dispensing, use or storage of hazardous materials.

**414.1.1 Other provisions.** Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of the *New York City Fire Code* and Section 415 of this code, including, but not limited to, location, installation and mechanical provisions.

**414.1.2 Materials.** The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in the *New York City Mechanical Code*, the *New York City Fire Code*,<sup>‡</sup> and Sections 307 and 415 of this code.

**414.1.2.1 Aerosols.** Level 2 and 3 aerosol products shall be stored and displayed in accordance with the *New York City Fire Code*.

**414.1.3 Information required.** A report shall be submitted to the department identifying the maximum expected quantities of hazardous materials to be stored, used in a closed system and used in an open system, and subdivided to separately address hazardous material classification categories based on Tables 307.1(1) and 307.1(2). The methods of protection from such hazards, including but not limited to control areas, fire protection systems and Group H occupancies shall be indicated in the report and on the construction documents. The opinion and report shall be prepared by a qualified person, firm or corporation approved by the commissioner and shall be provided without charge to the department.

For buildings and structures with an occupancy in Group H, separate floor plans shall be submitted identifying the locations of anticipated contents and processes so as to reflect the nature of each occupied portion of every building and structure.

**414.2 Control areas.** Control areas shall comply with the *New York City Fire Code* and Sections 414.2.1 through 414.2.5 of this code.

**414.2.1 Construction requirements.** Control areas shall be separated from each other by fire barriers constructed in accordance with Sections 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**414.2.2 Percentage of maximum allowable quantities.** The percentage of maximum allowable quantities of hazardous materials per control area permitted at each floor level within a building shall be in accordance with Table 414.2.2.

**414.2.3 Number.** The maximum number of control areas within a building shall be in accordance with Table 414.2.2.



**414.2.4 Fire-resistance-rating requirements.** The required fire-resistance rating for fire barriers shall be in accordance with Table 414.2.2. The floor assembly of the control area, and the construction supporting the floor of the control area, shall have a minimum 2-hour fire-resistance rating and shall comply with the requirements of the *New York City Fire Code*.

**Exception:** The floor assembly of the control area and the construction supporting the floor of the control area are allowed to be 1-hour fire-resistance rated in buildings of Types IIA, IIIA and VA construction, provided that both of the following conditions exist:

1. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1; and
2. The building is three or fewer stories above grade plane.

**414.2.5 Hazardous material in Group M display and storage areas and in Group S storage areas.** The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single control area of a Group M display and storage, a Group S storage area or an outdoor control area is permitted to exceed the maximum allowable quantities per control area specified in Tables 307.1(1) and 307.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with the *New York City Fire Code* and quantities do not exceed the maximum allowable specified in Table 414.2.5(1) of this code.

In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per control area as indicated in Table 414.2.5(2) of this code, provided that the materials are displayed and stored in accordance with the *New York City Fire Code*.

The maximum quantity of aerosol products in Group M occupancy retail display areas, storage areas adjacent to retail display areas and retail storage areas shall be in accordance with the *New York City Fire Code*.

**414.2.5.1 Below-grade storage of flammable or combustible mixtures accessory to Group M establishments.** Class I liquids shall not be stored in below-grade locations. Storage of Class II and Class III liquids, accessory to retail stores, and partly or completely below grade shall be permitted, provided that such below-grade area is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 and enclosed by fire barriers having a fire-resistance rating of at least 2 hours, constructed in accordance with the construction type of the building. Openings shall be protected by self-closing assemblies having a fire-resistance rating of at least 1½ hours.

**Exception:** Class IIIB liquids may be stored in below-grade locations that are not provided throughout with an automatic sprinkler system

when such liquids are stored in a room that is separated, vertically and horizontally, from surrounding spaces by fire barriers of not less than 2-hour fire-resistance rating and such room is provided with an automatic sprinkler system.

**414.3 Ventilation.** Rooms, areas or spaces of Group H in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated as required by the *New York City Fire Code* and the *New York City Mechanical Code*. Ducts conveying explosives or flammable vapors, fumes or dusts shall extend directly to the exterior of the building without entering other spaces. Exhaust ducts shall not extend into or through ducts and plenums.

**Exception:** Ducts conveying vapor or fumes having flammable constituents less than 25 percent of their lower flammable limit (LFL) are permitted to pass through other spaces.

Emissions generated at workstations shall be confined to the area in which they are generated as specified in the *New York City Fire Code* and the *New York City Mechanical Code*.

The location of supply and exhaust openings shall be in accordance with the *New York City Mechanical Code*. Exhaust air contaminated by highly toxic material shall be treated in accordance with the *New York City Fire Code*.

A manual shutoff control for ventilation equipment required by this section shall be provided outside the room adjacent to the principal access door to the room. The switch shall be of the break-glass type and shall be labeled: VENTILATION SYSTEM EMERGENCY SHUTOFF.

**414.4 Hazardous material systems.** Systems involving hazardous materials shall be suitable for the intended application. Controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls, where provided, shall be designed to be fail safe.

**414.5 Inside storage, dispensing and use.** The inside storage, dispensing and use of hazardous materials in excess of the maximum allowable quantities per control area of Tables 307.1(1) and 307.1(2) shall be in accordance with the *New York City Fire Code* and Sections 414.5.1 through 414.5.5 of this code.

**414.5.1 Explosion control.** Explosion control shall be provided in accordance with the *New York City Fire Code* as required by Table 414.5.1 where quantities of hazardous materials specified in that table exceed the maximum allowable quantities in Table 307.7(1) or where a structure, room or space is occupied for purposes involving explosion hazards as required by the *New York City Fire Code* or Section 415 of this code.

**414.5.2 Monitor control equipment.** Monitor control equipment shall be provided where required by the *New York City Fire Code*.



**SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY**

**TABLE 414.2.2  
DESIGN AND NUMBER OF CONTROL AREAS**

NYC	FLOOR LEVEL		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA <sup>a</sup>	NUMBER OF CONTROL AREAS PER FLOOR <sup>b</sup>	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS <sup>b</sup>
Above grade	Higher than 9		5	1	2
	7-9		5	2	2
	6		12.5	2	2
	5		12.5	2	2
	4		12.5	2	2
	3		50	2	1
	2		75	3	1
	1		100	4	1
Below grade	1		75	3	1
	2		50	2	1
	Lower than 2		Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.

b. Fire barriers shall include walls and floors as necessary to provide separation from other portions of the building.

**TABLE 414.2.5†(1)  
MAXIMUM ALLOWABLE QUANTITY PER INDOOR AND OUTDOOR CONTROL AREA IN GROUP M AND S OCCUPANCIES  
NONFLAMMABLE SOLIDS AND NONFLAMMABLE AND NONCOMBUSTIBLE LIQUIDS<sup>d,e,f</sup>**

CONDITION		MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA	
Material <sup>a</sup>	Class	Solids pounds	Liquids gallons
<b>Health-hazard materials—nonflammable and noncombustible solids and liquids</b>			
Corrosives <sup>b,c</sup>	Not Applicable	9,750	975
Highly toxics	Not Applicable	20 <sup>b,c</sup>	2 <sup>b,c</sup>
Toxics <sup>b,c</sup>	Not Applicable	1,000	100
<b>Physical-hazard materials—nonflammable and noncombustible solids and liquids</b>			
1. Oxidizers <sup>b,c</sup>	4	Not Allowed	Not Allowed
	3	1,150 <sup>g</sup>	115
	2	2,250 <sup>h</sup>	225
	1	18,000 <sup>i,j</sup>	1,800 <sup>i,j</sup>
2. Nondetonable unstable (reactives) <sup>b,c</sup>	4	Not Allowed	Not Allowed
	3	550	55
	2	1,150	115
	1	Not Limited	Not Limited
3. Nondetonable water-reactives	3 <sup>b,c</sup>	550	55
	2 <sup>b,c</sup>	1,150	115
	1	Not Limited	Not Limited

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L.

a. Hazard categories are as specified in the *New York City Fire Code*.

b. Maximum allowable quantities shall be increased 100 percent in buildings that are sprinklered in accordance with Section 903.3.1.1. When Note c also applies, the increase for both notes shall be applied cumulatively.

c. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, in accordance with the *New York City Fire Code*. When Note b also applies, the increase for both notes shall be applied cumulatively.

d. See Table 414.2.2 for design and number of control areas.

e. Allowable quantities for other hazardous material categories shall be in accordance with Section 307.

f. Maximum quantities shall be increased 100 percent in outdoor control areas.

g. Maximum amounts are permitted to be increased to 2,250 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.

h. Maximum amounts are permitted to be increased to 4,500 pounds when individual packages are in the original sealed containers from the manufacturer or packager and do not exceed 10 pounds each.

i. The permitted quantities shall not be limited in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

j. Quantities are unlimited in an outdoor control area.

**TABLE 414.2.5(2)**  
**MAXIMUM ALLOWABLE QUANTITY OF FLAMMABLE AND COMBUSTIBLE LIQUIDS**  
**IN WHOLESALE AND RETAIL SALES OCCUPANCIES PER CONTROL AREA<sup>a</sup>**

TYPE OF LIQUID	MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA (gallons)		
	Sprinklered in accordance with note b densities and arrangements	Sprinklered in accordance with Tables 3404.3.6.3(4) through 3404.3.6.3(8) and Table 3404.3.7.5.1 of the <i>New York City Fire Code</i>	Nonsprinklered
Class IA	60	60	30
Class IB, IC, II and IIIA	7,500 <sup>c</sup>	15,000 <sup>c</sup>	1,600
Class IIIB	Unlimited	Unlimited	13,200

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929m<sup>2</sup>, 1 gallon = 3.785 L, 1 gallon per minute per square foot = 40.75 L/min/m<sup>2</sup>.

a. Control areas shall be separated from each other by not less than a 1-hour fire barrier wall.

b. To be considered as sprinklered, a building shall be equipped throughout with an approved automatic sprinkler system with a design providing minimum densities as follows:

1. For uncartoned commodities on shelves 6 feet or less in height where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of Ordinary Hazard Group 2.
2. For cartoned, palletized or racked commodities where storage is 4 feet 6 inches or less in height and where the ceiling height does not exceed 18 feet, quantities are those permitted with a minimum sprinkler design density of 0.21 gallon per minute per square foot over the most remote 1,500-square-foot area.

c. Where wholesale and retail sales or storage areas exceed 50,000 square feet in area, the maximum allowable quantities are allowed to be increased by 2 percent for each 1,000 square feet of area in excess of 50,000 square feet, up to a maximum of 100 percent of the table amounts. A control area separation is not required. The cumulative amounts, including amounts attained by having an additional control area, shall not exceed 30,000 gallons.

**414.5.3 Automatic fire detection systems.** Group H occupancies shall be provided with an automatic fire detection system in accordance with Section 907.2.

**414.5.4 Emergency or standby power.** Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with Chapter 27.

**Exceptions:**

1. Mechanical ventilation for storage of Class IB and Class IC flammable and combustible liquids in closed containers not exceeding 6.5 gallons (25 L) capacity.
2. Storage areas for Class 1 and 2 oxidizers.
3. Storage areas for Class III, IV and V organic peroxides.
4. For storage, use and handling areas for highly toxic or toxic materials, see Chapter 37 of the *New York City Fire Code*.
5. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an approved fail-safe engineered system is installed.

**414.5.5 Spill control, drainage and containment.** Rooms, buildings or areas occupied for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire protection water discharged in the storage area where required in the *New York City Fire Code*. The methods of spill control shall be in accordance with the *New York City Fire Code*.

**414.5.6 Storage of medical gases.** When required by the *New York City Fire Code*, a one-hour room shall be provided for the storage of medical gases inside of buildings, with the protected openings and ventilation provisions as required by the *New York City Fire Code*.

**414.6 Outdoor storage, dispensing and use.** The outdoor storage, dispensing and use of hazardous materials shall be in accordance with the *New York City Fire Code*.

**414.6.1 Weather protection.** Where weather protection is provided for sheltering outdoor hazardous material storage or use areas, such areas shall be considered outdoor storage or use when the weather protection structure complies with Sections 414.6.1.1 through 414.6.1.3:

**414.6.1.1 Walls.** Walls shall not obstruct more than one side of the structure.

**Exception:** Walls shall be permitted to obstruct portions of multiple sides of the structure, provided that the obstructed area does not exceed 25 percent of the structure's perimeter.

**414.6.1.2 Separation distance.**‡ The distance from the structure to buildings, lot lines, public ways or means of egress to a public way shall not be less than the distance required for an outside hazardous material storage or use area without weather protection.

**414.6.1.3 Noncombustible construction.** The overhead structure shall be of approved noncombustible construction with a maximum area of 1,500 square feet (140 m<sup>2</sup>).

**Exception:** The increases permitted by Section 506 apply.

**SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY**

**TABLE 414.5.1  
EXPLOSION CONTROL REQUIREMENTS<sup>a</sup>**

MATERIAL	CLASS	EXPLOSION CONTROL METHODS	
		Barricade construction	Explosion (deflagration) venting or explosion (deflagration) prevention systems <sup>b</sup>
HAZARD CATEGORY			
Combustible dusts <sup>c</sup>	—	Not Required	Required
Cryogenic flammables	—	Not Required	Required
Explosives	Division 1.1	Required	Not Required
	Division 1.2	Required	Not Required
	Division 1.3	Not Required	Required
	Division 1.4	Not Required	Required
	Division 1.5	Required	Not Required
	Division 1.6	Required	Not Required
Flammable gas	Gaseous	Not Required	Required
	Liquefied	Not Required	Required
Flammable liquid	IA <sup>d</sup>	Not Required	Required
	IB <sup>e</sup>	Not Required	Required
Organic peroxides <sup>g</sup>	Unclassified detonable	Required	Not Permitted
		Required	Not Permitted
Oxidizer liquids and solids	4	Required	Not Permitted
Pyrophoric material <sup>g</sup>	Detonable	Required	Not Permitted
Pyrophoric gas <sup>g</sup>	Nondetonable	Not Required	Required
Unstable (reactive)	4	Required	Not Permitted
	3 Detonable	Required	Not Permitted
	3 Nondetonable	Not Required	Required
Water-reactive liquids and solids <sup>g</sup>	3 Detonable	Required	Not Permitted
	3 Nondetonable	Not Required	Required
	2 Detonable	Required	Not Permitted
	2 <sup>g</sup> Nondetonable	Not Required	Required
SPECIAL USES			
Grain processing	—	Not Required	Required
Where explosion hazards exist <sup>f</sup>	Detonation	Required	Not Permitted
	Deflagration	Not Required	Required

a. See Section 414.1.3.

b. See the *New York City Fire Code*.

c. As generated during manufacturing or processing. See definition of “Combustible dust” in Chapter 3.

d. Storage or use.

e. In open use or dispensing.

f. Rooms containing dispensing and use of hazardous materials when an explosive environment can occur because of the characteristics or nature of the hazardous materials or as a result of the dispensing or use process.

g. Considered as explosives for the purposes of storage.

**414.7 Emergency alarms.** Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided as set forth herein.

**414.7.1 Storage.** An approved manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior exit or exit access door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

**414.7.2 Dispensing, use and handling.** Where hazardous materials having a hazard ranking of 3 or 4 in accordance

with NFPA 704 are transported through corridors or exit enclosures, there shall be an emergency telephone system, a local manual alarm station or an approved alarm-initiating device at not more than 150-foot (45 720 mm) intervals and at each exit and exit access doorway throughout the transport route. The signal shall be relayed to an approved central station, or remote supervising station service or constantly attended on-site location and shall also initiate a local audible alarm.

**414.7.3 Supervision.** Emergency alarm systems shall be supervised by an approved central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

NYC

## SECTION BC 415 GROUPS H-1, H-2, H-3, H-4 AND H-5

**415.1 Scope.** The provisions of Sections 415.1 through 415.8 shall apply to the storage and use of hazardous materials in excess of the maximum allowable quantities per control area listed in Section 307.1. Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 414 and the *New York City Fire Code*, including, but not limited to, location and installation provisions.

**415.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in the code, have the meanings shown herein.

**CONTINUOUS GAS-DETECTION SYSTEM.** A gas detection system where the analytical instrument is maintained in continuous operation and sampling is performed without interruption. Analysis is allowed to be performed on a cyclical basis at intervals not to exceed 30 minutes.

**DETACHED BUILDING.** A separate single-story building, without a basement or crawl space, used for the storage, handling or use of hazardous materials and located an approved distance from other buildings and structures.

**EMERGENCY CONTROL STATION.** An approved location on the premises of a semiconductor fabrication facility staffed by trained personnel that monitor the operation of equipment and systems including alert and alarm signals.

**EXHAUSTED ENCLOSURE.** A device, typically consisting of a hood equipped with a fan, that serves to capture and exhaust fumes, mist, vapors and gases generated at a workstation or other local environment. An exhausted enclosure does not include a room provided with general ventilation.

**FABRICATION AREA.** An area within a semiconductor fabrication facility in which processes using hazardous production materials are conducted.

**FLAMMABLE VAPORS OR FUMES.** The concentration of flammable constituents in air that exceed 25 percent of their lower flammable limit (LFL).

**GAS CABINET.** A fully enclosed, noncombustible enclosure used to provide an isolated environment for compressed gas containers in storage or use, including any doors and access ports for exchanging containers and accessing pressure-regulating controls.

**GAS ROOM.** A separately ventilated, fully enclosed room in which only compressed gases and associated equipment and supplies are stored or used.

**HAZARDOUS PRODUCTION MATERIAL (HPM).** A solid, liquid or gas associated with semiconductor manufacturing that has a degree-of-hazard rating in health, flammability or instability of Class 3 or 4 as defined in NFPA 704 and that is used directly in research, laboratory or production processes which have as their end product materials that are not hazardous.

**HPM FLAMMABLE LIQUID.** An HPM liquid that is defined as either a Class I flammable liquid or a Class II or Class IIIA combustible liquid.

**HPM ROOM.** A room used in conjunction with or serving a Group H-5 occupancy, where HPM is stored or used and that is classified as a Group H-2, H-3 or H-4 occupancy.

**IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH).** The concentration of air-borne contaminants that poses a threat of death, immediate or delayed permanent adverse health effects, or effects that could prevent escape from such an environment as established by the National Institute of Occupational Safety and Health (NIOSH) based on both toxicity and flammability. It generally is expressed in parts per million by volume (ppm v/v) or milligrams per cubic meter (mg/m<sup>3</sup>). If adequate data do not exist for precise establishment of IDLH concentrations, an independent certified industrial hygienist, industrial toxicologist, appropriate regulatory agency or other source approved by the Fire Commissioner shall make such determination.

**LIQUID.** A material that has a melting point that is equal to or less than 68°F (20°C) and a boiling point that is greater than 68°F (20°C) at 14.7 pounds per square inch absolute (psia) (101 kPa). When not otherwise identified, the term “liquid” includes both flammable and combustible liquids.

**LIQUID STORAGE ROOM.** A room classified as a Group H-3 occupancy used for the storage of flammable or combustible liquids in an unopened condition.

**LIQUID USE, DISPENSING AND MIXING ROOM.** A room in which Class I, II and IIIA flammable or combustible liquids are used, dispensed or mixed in open containers.

**LOWER FLAMMABLE LIMIT (LFL).** The minimum concentration of vapor in air at which propagation of flame will occur in the presence of an ignition source. The LFL is sometimes referred to as “LEL” or “lower explosive limit.”

**NORMAL TEMPERATURE AND PRESSURE (NTP).** A temperature of 70°F (21°C) and a pressure of 1 atmosphere [14.7 psia (101 kPa)].

**PHYSIOLOGICAL WARNING THRESHOLD LEVEL.** A concentration of air-borne contaminants, normally expressed in parts per million (ppm) or milligrams per cubic meter (mg/m<sup>3</sup>), that represents the concentration at which persons can sense the presence of the contaminant due to odor, irritation or other quick-acting physiological response. When used in conjunction with the permissible exposure limit (PEL) the physiological warning threshold levels are those consistent with the classification system used to establish the PEL. See the definition of “Permissible exposure limit (PEL)” in the *New York City Fire Code*.

**SERVICE CORRIDOR.** A fully enclosed passage other than one designated as a required means of egress, through which HPM can be moved during handling.

**SOLID.** A material that has a melting point, decomposes or sublimates at a temperature greater than 68°F (20°C).

**WORKSTATION.** A defined space within a fabrication area in which a specific function, laboratory procedure or research activity relating to semiconductor manufacture is conducted. A workstation may include equipment using HPM, hazardous materials storage cabinets, flammable liquid storage cabinets or gas cabinets, ventilation equipment,



NYC fire protection devices, detection devices, and electrical  
NYC devices.

**415.3 Fire separation distance.** Group H occupancies shall be located on property in accordance with the other provisions of this chapter. In Groups H-2 and H-3, not less than 25 percent of the perimeter wall of the occupancy shall be an exterior wall.

**Exceptions:**

- NYC 1. Liquid use, dispensing and mixing rooms having a  
NYC floor area of not more than 500 square feet (47 m<sup>2</sup>)  
NYC need not be located on the outer perimeter of the  
NYC building where they are in accordance with the *New  
York City Fire Code* and NFPA 30.
- NYC 2. Liquid storage rooms having a floor area of not  
NYC more than 1,000 square feet (93 m<sup>2</sup>) need not be  
NYC located on the outer perimeter where they are in  
NYC accordance with the *New York City Fire Code* and  
NYC NFPA 30.
- NYC 3. Spray paint booths that comply with the *New York  
NYC City Fire Code* need not be located on the outer  
NYC perimeter.

**415.3.1 Group H occupancy minimum fire separation distance.** Regardless of any other provisions, buildings containing Group H occupancies shall be set back to the minimum fire separation distance as set forth in Items 1 through 4 below. Distances shall be measured from the walls enclosing the occupancy to lot lines, including those on a public way. Distances to assumed tax lot lines established for the purposes of determining exterior wall and opening protection, in accordance with Section 705.3, are not to be used to establish the minimum fire separation distance for buildings on sites where explosives are manufactured or used when separation is provided in accordance with the quantity distance tables specified for explosive materials in the *New York City Fire Code*.

- NYC 1. Group H-1. Not less than 75 feet (22 860 mm) and  
NYC not less than required by the *New York City Fire  
Code*.

**Exceptions:**

1. Fireworks manufacturing buildings separated in accordance with NFPA 1124.

2. Buildings containing the following materials when separated in accordance with Table 415.3.1:

- 2.1. Organic peroxides, unclassified detonable.
- 2.2. Unstable reactive materials Class 4.
- 2.3. Unstable reactive materials, Class 3 detonable.
- 2.4. Detonable pyrophoric materials.

2. Group H-2. Not less than 30 feet (9144 mm) where the area of the occupancy exceeds 1,000 square feet (93 m<sup>2</sup>), and it is not required to be located in a detached building.
3. Groups H-2 and H-3. Not less than 50 feet (15 240 mm) where a detached building is required (see Table 415.3.2).
4. Groups H-2 and H-3. Occupancies containing materials with explosive characteristics shall be separated as required by the *New York City Fire Code*. Where separations are not specified, the distances required shall not be less than the distances required by Table 415.3.1.

**415.3.2 Detached buildings for Group H-1 and H-2 or H-3.** The storage of hazardous materials in excess of those amounts listed in Table 415.3.2 shall be in accordance with the applicable provisions of Sections 415.4 and 415.5. Where a detached building is required by Table 415.3.2, there are no requirements for wall and opening protection based on fire separation distance.

**415.4 Special provisions for Group H-1 occupancies.** Group H-1 occupancies shall be in buildings used for no other purpose, shall not exceed one story in height and be without basements, crawl spaces or other under-floor spaces. Roofs shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature. Group H-1 occupancies containing materials that are in themselves both physical and health hazards in quantities exceeding the maximum allowable quantities per control area in Table 307.7(2) shall comply with requirements for both Group H-1 and H-4 occupancies.

**TABLE 415.3.1**  
**MINIMUM SEPARATION DISTANCES FOR BUILDINGS CONTAINING EXPLOSIVE MATERIALS<sup>f</sup>**

QUANTITY OF EXPLOSIVE MATERIAL <sup>a, d</sup>		MINIMUM DISTANCE (feet)			NYC
		Lot lines <sup>b</sup> and inhabited buildings <sup>c</sup>		Separation of magazines <sup>e</sup>	NYC
Pounds over	Pounds not over	Barricaded	Unbarricaded		
0	5	70	140	12	
5	10	90	180	16	
10	20	110	220	20	
20	30	125	250	22	
30	40	140	280	24	
40	50	150	300	28	
50	75	170	340	30	
75	100	190	380	32	
100	125	200	400	36	
125	150	215	430	38	
150	200	235	470	42	
200	250	255	510	46	
250	300	270	540	48	
300	400	295	590	54	
400	500	320	640	58	
500	600	340	680	62	
600	700	355	710	64	
700	800	375	750	66	
800	900	390	780	70	
900	1,000	400	800	72	

For SI: 1 pound = 0.454 kg, 1 foot = 304.8 mm.

- a. The number of pounds of explosives listed is the number of pounds of trinitrotoluene (TNT) or the equivalent pounds of other explosive.
- b. The distance listed is the distance to lot line, including lot lines at public ways.
- c. For the purpose of this table, an inhabited building is any building on the same tax lot that is regularly occupied by people. Where two or more buildings containing explosives or magazines are located on the tax lot, each building or magazine shall comply with the minimum distances specified from inhabited buildings and, in addition, they shall be separated from each other by not less than the distance shown for "Separation of magazines," except that the quantity of explosive materials contained in detonator buildings or magazines shall govern in regard to the spacing of said detonator buildings or magazines from buildings or magazines containing other explosive materials. If any two or more buildings or magazines are separated from each other by less than the specified "Separation of magazines" distances, then such two or more buildings or magazines, as a group, shall be considered as one building or magazine, and the total quantity of explosive materials stored in such group shall be treated as if the explosive were in a single building or magazine located on the site of any building or magazine of the group, and shall comply with the minimum distance specified from other magazines or inhabited buildings.
- d. Storage of explosives in a quantity exceeding 1,000 pounds in one magazine is prohibited.
- e. Magazine is a building or structure, other than an operating building, approved for storage of explosive materials. Portable or mobile magazines not exceeding 120 square feet (11 m<sup>2</sup>) in area need not comply with the requirements of this code, however, all magazines shall comply with the *New York City Fire Code*.
- f. This table shall not apply to the temporary storage incidental to transportation.

**TABLE 415.3.2  
REQUIRED DETACHED STORAGE**

NYC

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DETACHED STORAGE IS REQUIRED WHEN THE QUANTITY OF MATERIAL EXCEEDS THAT LISTED HEREIN			
Material	Class	Solids and Liquids (tons) <sup>a,b</sup>	Gases (cubic feet) <sup>a,b</sup>
Explosives	Division 1.1 Division 1.2 Division 1.3 Division 1.4 Division 1.4 <sup>c</sup> Division 1.5 Division 1.6	Maximum Allowable Quantity Maximum Allowable Quantity Maximum Allowable Quantity Maximum Allowable Quantity 1 Maximum Allowable Quantity Maximum Allowable Quantity	Not Applicable
Oxidizers	Class 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Unstable (reactives) detonable	Class 3 or 4	Maximum Allowable Quantity	Maximum Allowable Quantity
Water-reactives detonable	Class 2 or 3	Maximum Allowable Quantity	Not Applicable
Oxidizer, liquids and solids	Class 3 Class 2	1,200 2,000	Not Applicable Not Applicable
Organic peroxides	Unclassified Detonable Class I Class II Class III	Maximum Allowable Quantity Maximum Allowable Quantity 25 50	Not Applicable Not Applicable Not Applicable Not Applicable
Unstable (reactives) nondetonable	Class 3 Class 2	1 25	2,000 10,000
Water reactives nondetonable	Class 3 Class 2	1 25	Not Applicable Not Applicable
Pyrophoric materials detonable	Not Applicable	Maximum Allowable Quantity	Maximum Allowable Quantity
Pyrophoric gases and nondetonables	Not Applicable	Not Applicable	2,000

For SI: 1 ton = 2,000 pounds = 906 kg, 1 cubic foot = 0.02832 m<sup>3</sup>, 1 pound = 0.454 kg.

- a. For materials that are detonable, the distance to other buildings or lot lines shall be as specified in Table 415.3.1 based on trinitrotoluene (TNT) equivalence of the material. For materials classified as explosives, see the *New York City Fire Code*. Unclassified detonable organic peroxides, detonable pyrophoric materials, detonable unstable (reactive) materials and detonable water-reactive materials shall be considered as explosives for the purposes of storage.
- b. "Maximum Allowable Quantity" means the maximum allowable quantity per control area set forth in Table 307.1(1).
- c. Limited to Division 1.4 materials and articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco and Firearms (BATF) regulations or unpackaged articles used in process operations that do not propagate a detonation or deflagration between articles, providing the net explosive weight of individual articles does not exceed 1 pound.

**415.4.1 Floors in storage rooms.** Floors in storage areas for organic peroxides, pyrophoric materials and unstable (reactive) materials shall be of liquid-tight, noncombustible construction.

**415.5 Special provisions for Groups H-2 and H-3 occupancies.** Group H-2 and H-3 occupancies containing quantities of hazardous materials in excess of those set forth in Table 415.3.2 shall be in buildings used for no other purpose, shall not exceed one story in height and shall be without basements, crawl spaces or other under-floor spaces. Group H-2 and H-3 occupancies containing water-reactive materials shall be resistant to water penetration. Piping for conveying liquids shall not be over or through areas containing water reactives, unless isolated by approved liquid-tight construction.

**Exception:** Fire protection piping.

**415.5.1 Floors in storage rooms.** Floors in storage areas for organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials and water-reactive solids and liquids shall be of liquid-tight, noncombustible construction.

**415.5.2 Waterproof room.** Rooms or areas used for the storage of water-reactive solids and liquids shall be constructed in a manner that resists the penetration of water through the use of waterproof materials. Piping carrying water for other than approved automatic fire sprinkler systems shall not be within such rooms or areas.

**415.6 Group H-2.** Occupancies in Group H-2 shall be constructed in accordance with the *New York City Fire Code* and Sections 415.6.1 through 415.6.4 of this code.

**415.6.1 Combustible dusts, grain processing and storage.** The provisions of Sections 415.6.1.1 through 415.6.1.5 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with the applicable provisions of NFPA 61, NFPA 69, NFPA 120, NFPA 484, NFPA 651, NFPA 654, NFPA 655, NFPA 664 and NFPA 85, and the *New York City Fire Code*.

**415.6.1.1 Type of construction and height exceptions.** Buildings shall be constructed in compliance with the height and area limitations of Table 503 for

Group H-2; except that where erected of Type I or II construction, the heights and areas of grain elevators and similar structures shall be unlimited, and where of Type IV construction, the maximum height shall be 65 feet (19 812 mm) and except further that, in isolated areas, the maximum height of Type IV structures shall be increased to 85 feet (25 908 mm).

**415.6.1.2 Grinding rooms.** Every room or space occupied for grinding or other operations that produce combustible dusts shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The minimum fire-resistance rating shall be 2 hours where the area is not more than 3,000 square feet (279 m<sup>2</sup>), and 4 hours where the area is greater than 3,000 square feet (279 m<sup>2</sup>).

**415.6.1.3 Conveyors.** Conveyors, chutes, piping and similar equipment passing through the enclosures of rooms or spaces shall be constructed dirt tight and vapor tight, and be of approved noncombustible materials complying with Chapter 30.

**415.6.1.4 Explosion control.** Explosion control shall be provided as specified in the *New York City Fire Code*, or spaces shall be equipped with the equivalent mechanical ventilation complying with the *New York City Mechanical Code*.

**415.6.1.5 Grain elevators.** Grain elevators, malt houses and buildings for similar occupancies shall not be located within 30 feet (9144 mm) of interior lot lines or structures on the same lot, except where erected along a railroad right-of-way.

**415.6.1.6 Coal pockets.** Coal pockets located less than 30 feet (9144 mm) from interior lot lines or from structures on the same lot shall be constructed of not less than Type IB construction. Where more than 30 feet (9144 mm) from interior lot lines, or where erected along a railroad right-of-way, the minimum type of construction of such structures not more than 65 feet (19 812 mm) in building height shall be Type IV.

**415.6.2 Flammable and combustible liquids.** The storage, handling, processing and transporting of flammable and combustible liquids in Groups H-2 and H-3 occupancies shall be in accordance with the *New York City Mechanical Code*, the *New York City Fire Code*, and Sections 415.6.2.1 through 415.6.2.10 of this code.

**415.6.2.1 Mixed occupancies.** Where the storage tank area is located in a building of two or more occupancies, and the quantity of liquid exceeds the maximum allowable quantity for one control area, the use shall be completely separated from adjacent fire areas in accordance with the requirements of Section 508.4.

**415.6.2.1.1 Height exception.** Where storage tanks are located within a building no more than one story above grade plane, the height limitation of Section 503 shall not apply for Group H.

**415.6.2.2 Tank protection.** Storage tanks shall be noncombustible and protected from physical damage.

Fire barriers or horizontal assemblies or both around the storage tank(s) shall be permitted as the method of protection from physical damage.

**415.6.2.3 Tanks.** Storage tanks shall be approved tanks conforming to the requirements of the *New York City Fire Code*.

**415.6.2.4 Suppression.** Group H shall be equipped throughout with an approved automatic sprinkler system, installed in accordance with Section 903.

**415.6.2.5 Leakage containment.** A liquid-tight containment area compatible with the stored liquid shall be provided. The method of spill control, drainage control and secondary containment shall be in accordance with the *New York City Fire Code*.

**Exception:** Rooms where only double-wall storage tanks conforming to Section 415.6.2.3 are used to store Class I, II and IIIA flammable and combustible liquids shall not be required to have a leakage containment area.

**415.6.2.6 Leakage alarm.** An approved automatic alarm shall be provided to indicate a leak in a storage tank and room. The alarm shall sound an audible signal, 15 dBA above the ambient sound level, at every point of entry into the room in which the leaking storage tank is located. An approved sign shall be posted on every entry door to the tank storage room indicating the potential hazard of the interior room environment, or the sign shall state: WARNING, WHEN ALARM SOUNDS, THE ENVIRONMENT WITHIN THE ROOM MAY BE HAZARDOUS. The leakage alarm shall also be supervised in accordance with Chapter 9 to transmit a trouble signal.

**415.6.2.7 Tank vent.** Storage tank vents for Class I, II or IIIA liquids shall terminate to the outdoor air in accordance with the *New York City Fire Code*.

**415.6.2.8 Room ventilation.** Storage tank areas storing Class I, II or IIIA liquids shall be provided with mechanical ventilation. The mechanical ventilation system shall be in accordance with the *New York City Mechanical Code* and the *New York City Fire Code*.

**415.6.2.9 Explosion venting.** Where Class I liquids are being stored, explosion venting shall be provided in accordance with the *New York City Fire Code*.

**415.6.2.10 Tank openings other than vents.** Tank openings other than vents from tanks inside buildings shall be designed to ensure that liquids or vapor concentrations are not released inside the building.

**415.6.3 Liquefied petroleum gas-distribution facilities.** The construction and installation of liquefied petroleum gas facilities shall be in accordance with the requirements of this code, the *New York City Fire Code*, the *New York City Mechanical Code*, the *New York City Fuel Gas Code* and NFPA 58.

**415.6.4 Dry cleaning plants.** The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the *New York City Mechanical Code*.



NYC *ical Code, the New York City Plumbing Code and NFPA 32. Dry cleaning solvents and systems shall be classified in accordance with the New York City Fire Code.*

NYC **415.7 Groups H-3 and H-4.** Groups H-3 and H-4 shall be constructed in accordance with the applicable provisions of this code and the *New York City Fire Code*.

**415.7.1 Flammable and combustible liquids.** The storage, handling, processing and transporting of flammable and combustible liquids in Group H-3 occupancies shall be in accordance with Section 415.6.2.

NYC **415.7.2 Gas rooms.** When gas rooms are provided, such rooms shall be separated from other areas by not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**415.7.3 Floors in storage rooms.** Floors in storage areas for corrosive liquids and highly toxic or toxic materials shall be of liquid-tight, noncombustible construction.

NYC **415.7.4 Separation—highly toxic solids and liquids.** Highly toxic solids and liquids not stored in approved hazardous materials storage cabinets shall be isolated from other hazardous materials storage by construction having a 1-hour fire-resistance rating.

#### NYC **415.8 Group H-5.**

NYC **415.8.1 General.** In addition to the requirements set forth elsewhere in this code, Group H-5 shall comply with the provisions of the *New York City Fire Code* and Section 415.9 of this code, including, but not limited to, automatic sprinkler protection for workstations, gas cabinets, exhausted enclosures, pass-throughs in exit access corridors and exhaust ducts.

#### **415.8.2 Fabrication areas.**

##### **415.8.2.1 Hazardous materials in fabrication areas.**

**415.8.2.1.1 Aggregate quantities.** The aggregate quantities of hazardous materials stored and used in a single fabrication area shall not exceed the quantities set forth in Table 415.8.2.1.1.

**Exception:** The quantity limitations for any hazard category in Table 415.8.2.1.1 shall not apply where the fabrication area contains quantities of hazardous materials not exceeding the maximum allowable quantities per control area established by Tables 307.1(1) and 307.1(2).

**415.8.2.1.2 Hazardous production materials.** The maximum quantities of hazardous production materials (HPM) stored in a single fabrication area shall not exceed the maximum allowable quantities per control area established by Tables 307.1(1) and 307.1(2).

**415.8.2.2 Separation.** Fabrication areas, whose sizes are limited by the quantity of hazardous materials allowed by Table 415.8.2.1.1, shall be separated from each other, from corridors, and from other parts of the building by not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

#### **Exceptions:**

1. Doors within such fire barrier walls, including doors to corridors, shall be only self-closing fire assemblies having a fire-protection rating of not less than  $\frac{3}{4}$  hour. NYC
2. Windows between fabrication areas and exit access corridors are permitted to be fixed glazing listed and labeled for a fire protection rating of at least  $\frac{3}{4}$  hour in accordance with Section 715. NYC

**415.8.2.3 Location of occupied levels.** Occupied levels of fabrication areas shall be located at or above the first story above grade plane.

**415.8.2.4 Floors.** Except for surfacing, floors within fabrication areas shall be of noncombustible construction. Openings through floors of fabrication areas are permitted to be unprotected where the interconnected levels are used solely for mechanical equipment directly related to such fabrication areas (see also Section 415.8.2.5). Floors forming a part of an occupancy separation shall be liquid tight.

**415.8.2.5 Shafts and openings through floors.** Elevator shafts, vent shafts and other openings through floors shall be enclosed when required by Section 708. Mechanical, duct and piping penetrations within a fabrication area shall not extend through more than two floors. The annular space around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The fabrication area, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

**415.8.2.6 Ventilation.** Mechanical exhaust ventilation at the rate of not less than 1 cubic foot per minute per square foot [ $0.0051 \text{ m}^3/(\text{s} \cdot \text{m}^2)$ ] of floor area shall be provided throughout portions of the fabrication area where HPM are used or stored. The exhaust air duct system of one fabrication area shall not connect to another duct system outside that fabrication area within the building. NYC

A ventilation system shall be provided to capture and exhaust fumes and vapors at workstations. NYC

Two or more operations at a workstation shall not be connected to the same exhaust system where either one or the combination of the substances removed could constitute a fire, explosion or hazardous chemical reaction within the exhaust duct system.

Exhaust ducts penetrating occupancy separations shall be contained in a shaft of equivalent fire-resistance-rated construction. Exhaust ducts shall not penetrate firewalls.

Fire dampers shall not be installed in exhaust ducts.

**SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY**

**TABLE 415.8.2.1.1  
QUANTITY LIMITS FOR HAZARDOUS MATERIALS IN A SINGLE FABRICATION AREA IN GROUP H-5<sup>a</sup>**

HAZARD CATEGORY	SOLIDS (pounds per square foot)	LIQUIDS (gallons per square foot)	GAS SCF/square foot)	NYC
<b>PHYSICAL-HAZARD MATERIALS</b>				
Combustible dust	Note b	Not Applicable	Not Applicable	
Combustible fiberLoose	Note b	Not Applicable	Not Applicable	
Baled	Notes b, c	Not Applicable	Not Applicable	
Combustible liquidII		0.01		
IIIA		0.02		
IIIB	Not Applicable	Not Limited	Not Applicable	
Combination Class I, II and IIIA		0.04		
Cryogenic gas	Flammable		Note c	NYC
Oxidizing	Not Applicable	Not Applicable	1.25	
Explosives	Note b	Note b	Note b	
Flammable gas	Gaseous		Note c	NYC
Liquefied	Not Applicable	Not Applicable	Note c	NYC
Flammable liquid	IA	0.0025		NYC
IB		0.025		NYC
IC	Not Applicable	0.025	Not Applicable	NYC
Combination Class IA, IB and IC		0.025		NYC
Combination Class I, II and IIIA		0.04		NYC
Flammable solid	0.001	Not Applicable	Not Applicable	
Organic peroxide				
Unclassified detonable	Note b			
Class I	Note b			
Class II	0.025	Not Applicable	Not Applicable	
Class III	0.1			
Class IV	Not Limited			
Class V	Not limited			
Oxidizing gasGaseous			1.25	
Liquefied	Not Applicable	Not Applicable	1.25	
Combination of gaseous and liquefied			1.25	
OxidizerClass 4	Note b	Note b		
Class 3	0.003	0.03		
Class 2	0.003	0.03	Not Applicable	
Class 1	0.003	0.03		
CombinationClass 1, 2, 3	0.003	0.03		
Pyrophoric material	Note b	0.00125	Notes d and e	
Unstable reactiveClass 4	Note b	Note b	Note b	
Class 3	0.025	0.0025	Note b	
Class 2	0.1	0.01	Note b	
Class 1	Not Limited	Not Limited	Not Limited	
Water reactiveClass 3	Note b	0.00125		
Class 2	0.25	0.025	Not Applicable	
Class 1	Not Limited	Not Limited		
<b>HEALTH-HAZARD MATERIALS</b>				
Corrosives	Not Limited	Not Limited	Not Limited	
Highly toxic	Not Limited	Not Limited	Note d	
Toxics	Not Limited	Not Limited	Note d	

For SI: 1 pound per square foot = 4.882 kg/m<sup>2</sup>, 1 gallon per square foot = 40.7 L/m<sup>2</sup>, 1 cubic foot @ NTP/square foot = 0.305 m<sup>3</sup> @ NTP/m<sup>2</sup>.  
1 cubic foot = 0.02832 m<sup>3</sup>

- Hazardous materials within piping shall not be included in the calculated quantities.
- Quantity of hazardous materials in a single fabrication shall not exceed the maximum allowable quantities per control area in Tables 307.1(1) and 307.1(2).
- Densely packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.
- The aggregate quantity of flammable, pyrophoric, toxic and highly toxic gases shall not exceed 9,000 SCF.
- The aggregate quantity of pyrophoric gases in the building shall not exceed the amounts set forth in Table 415.3.2.

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**415.8.2.7 Transporting hazardous production materials to fabrication areas.** Hazardous production materials shall be transported to fabrication areas through enclosed piping or tubing systems that comply with Section 415.8.6.1, through service corridors complying with Section 415.8.4, or in exit access corridors as permitted in the exception to Section 415.8.3. The handling or transporting of hazardous production materials within service corridors shall comply with the *New York City Fire Code*.

#### 415.8.2.8 Electrical.

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**415.8.2.8.1 General.** Electrical equipment and devices within the fabrication area shall comply with the *New York City Electrical Code*. The requirements for hazardous locations need not be applied where the average air change is at least four times that set forth in Section 415.8.2.6 and where the number of air changes at any location is not less than three times that required by Section 415.8.2.6. The use of recirculated air shall be permitted.

**415.8.2.8.2 Workstations.** Workstations shall not be energized without adequate exhaust ventilation. See Section 415.8.2.6 for workstation exhaust ventilation requirements.

| **415.8.3 Corridors.** Corridors shall comply with Chapter 10 and shall be separated from fabrication areas as specified in Section 415.8.2.2. Corridors shall not contain HPM $\ddagger$  and shall not be used for transporting such materials, except through closed piping systems as provided in Section 415.8.6.3.

| **Exception:** Where existing fabrication areas are altered or modified, HPM $\ddagger$  is allowed to be transported in existing corridors, subject to the following conditions:

- | 1. Corridors. Corridors adjacent to the fabrication area where the alteration work is to be done shall comply with Section 1018 for a length determined as follows:
  - | 1.1. The length of the common wall of the corridor and the fabrication area; and
  - | 1.2. For the distance along the corridor to the point of entry of HPM into the corridor serving that fabrication area.
- | 2. Emergency alarm system. There shall be an emergency telephone system, a local manual alarm station or other approved alarm-initiating device within corridors at not more than 150-foot (45 720 mm) intervals and at each exit and doorway. The signal shall be relayed to an approved central, proprietary or remote station service or the emergency control station and shall also initiate a local audible alarm.
- | 3. Pass-throughs. Self-closing doors having a fire-protection rating of not less than 1 hour shall separate pass-throughs from existing corridors. Pass-throughs shall be constructed as required for the

corridors, and protected by an approved automatic fire-extinguishing system.

#### 415.8.4 Service corridors.

**415.8.4.1 Occupancy.** Service corridors shall be classified as Group H-5.

**415.8.4.2 Use conditions.** Service corridors shall be separated from exit access corridors as required by Section 415.8.2.2. Service corridors shall not be used as a required exit access corridor. NYC

**415.8.4.3 Mechanical ventilation.** Service corridors shall be mechanically ventilated as required by Section 415.8.2.6 or at not less than six air changes per hour, whichever is greater. NYC

**415.8.4.4 Means of egress.** The maximum distance of travel from any point in a service corridor to an exit, exit access corridor or door into a fabrication area shall not exceed 75 feet (22 860 mm). Dead ends shall not exceed 4 feet (1219 mm) in length. There shall be not less than two exits, and not more than one-half of the required means of egress shall require travel into a fabrication area. Doors from service corridors shall swing in the direction of egress travel and shall be self-closing.

**415.8.4.5 Minimum width.** The minimum clear width of a service corridor shall be 5 feet (1524 mm), or 33 inches (838 mm) wider than the widest cart or truck used in the service corridor, whichever is greater. NYC

**415.8.4.6 Emergency alarm system.** Emergency alarm systems shall be provided in accordance with this section and Sections 414.7.1 and 414.7.2. The maximum allowable quantity per control area provisions shall not apply to emergency alarm systems required for HPM.

**415.8.4.6.1 Service corridors.** An emergency alarm system shall be provided in service corridors, with at least one alarm device in each service corridor.

**415.8.4.6.2 Exit access corridors and exit enclosures.** Emergency alarms for exit access corridors and exit enclosures shall comply with Section 414.7.2.

**415.8.4.6.3 Liquid storage rooms, HPM rooms and gas rooms.** Emergency alarms for liquid storage rooms, HPM rooms and gas rooms shall comply with Section 414.7.1.

**415.8.4.6.4 Alarm-initiating devices.** An approved emergency telephone system, local alarm manual pull stations, or other approved alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

**415.8.4.6.5 Alarm signals.** Activation of the emergency alarm system shall sound a local alarm and transmit a signal to the emergency control station.

#### 415.8.5 Storage of hazardous production materials.

**415.8.5.1 General.** Storage of HPM in fabrication areas shall be within approved or listed storage cabi-

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nets or gas cabinets, or within a workstation. The storage of hazardous production materials (HPM) in quantities greater than those listed in Section 1804.2 of the *New York City Fire Code* shall be in liquid storage rooms, HPM rooms or gas rooms as appropriate for the materials stored. The storage of other hazardous materials shall be in accordance with other applicable provisions of this code and the *New York City Fire Code*.

#### 415.8.5.2 Construction.

**415.8.5.2.1 HPM rooms and gas rooms.** HPM rooms and gas rooms shall be separated from other areas by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The minimum fire-resistance rating shall be 2 hours where the area is 300 square feet (27.9 m<sup>2</sup>) or more and 1-hour where the area is less than 300 square feet (27.9 m<sup>2</sup>).

**415.8.5.2.2 Liquid storage rooms.** Liquid storage rooms shall be constructed in accordance with the following requirements:

1. Rooms in excess of 500 square feet (46.5 m<sup>2</sup>) shall have at least one exterior door approved for Fire Department access.
2. Rooms shall be separated from other areas by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The fire-resistance rating shall be at least 1-hour for rooms up to 150 square feet (13.9 m<sup>2</sup>) in area and not less than 2 hours where the room is more than 150 square feet (13.9 m<sup>2</sup>) in area.
3. Shelving, racks and wainscoting in such areas shall be of noncombustible construction or wood of not less than 1-inch (25 mm) nominal thickness.
4. Rooms used for the storage of Class I flammable liquids shall not be located in a basement.

**415.8.5.2.3 Floors.** Except for surfacing, floors of HPM rooms and liquid storage rooms shall be of noncombustible liquid-tight construction. Raised grating over floors shall be of noncombustible materials.

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**415.8.5.3 Location.** Where HPM rooms, liquid storage rooms and gas rooms are provided, they shall have at least one exterior wall and such wall shall be not less than 30 feet (9144 mm) from tax-lot lines, including tax-lot lines adjacent to public ways.

**415.8.5.4 Explosion control.** Explosion control shall be provided where required by Section 414.5.1.

**415.8.5.5 Exits.** Where two exits are required from HPM rooms, liquid storage rooms and gas rooms, one shall be directly to the outside of the building.

**415.8.5.6 Doors.** Doors in a fire barrier wall, including doors to corridors, shall be self-closing fire door

assemblies having a fire-protection rating of not less than <sup>3</sup>/<sub>4</sub> hour.

**415.8.5.7 Ventilation.** Mechanical exhaust ventilation shall be provided in liquid storage rooms, HPM rooms and gas rooms at the rate of not less than 1 cubic foot per minute per square foot (0.044 L/S/m<sup>2</sup>) of floor area or six air changes per hour, whichever is greater, for categories of material.

Exhaust ventilation for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding areas and direct the exhaust ventilation to an exhaust system.

**415.8.5.8 Emergency alarm system.** An approved emergency alarm system shall be provided for HPM rooms, liquid storage rooms and gas rooms.

Emergency alarm-initiating devices shall be installed outside of each interior exit door of such rooms.

Activation of an emergency alarm-initiating device shall sound a local alarm and transmit a signal to the emergency control station.

An approved emergency telephone system, local alarm manual pull stations or other approved alarm-initiating devices are allowed to be used as emergency alarm-initiating devices.

#### 415.8.6 Piping and tubing.

**415.8.6.1 General.** Hazardous production materials piping and tubing shall comply with Sections 416.8.6.1 through 416.8.6.4 and ASME B31.3.

##### 415.8.6.2 Supply piping and tubing.

**415.8.6.2.1 HPM having a health-hazard ranking of 3 or 4.** Systems supplying HPM liquids or gases having a health-hazard ranking of 3 or 4 shall be welded throughout, except for connections, to the systems that are within a ventilated enclosure if the material is a gas, or an approved method of drainage or containment is provided for the connections if the material is a liquid.

**415.8.6.2.2 Location in service corridors.** Hazardous production materials supply piping or tubing in service corridors shall be exposed to view.

**415.8.6.2.3 Excess flow control.** Where HPM gases or liquids are carried in pressurized piping above 15 pounds per square inch gauge (psig) (103.4 kPa), excess flow control shall be provided. Where the piping originates from within a liquid storage room, HPM room or gas room, the excess flow control shall be located within the liquid storage room, HPM room or gas room. Where the piping originates from a bulk source, the excess flow control shall be located as close to the bulk source as practical.

**415.8.6.3 Installations in corridors and above other occupancies.** The installation of HPM piping and tubing within the space defined by the walls of exit access corridors and the floor or roof above or



in concealed spaces above other occupancies shall be in accordance with Section 415.8.6.2 and the following conditions:

1. Automatic sprinklers shall be installed within the space unless the space is less than 6 inches (152 mm) in the least dimension.
2. Ventilation not less than six air changes per hour shall be provided. The space shall not be used to convey air from any other area.
3. Where the piping or tubing is used to transport HPM liquids, a receptor shall be installed below such piping or tubing. The receptor shall be designed to collect any discharge or leakage and drain it to an approved location. The 1-hour enclosure shall not be used as part of the receptor.
4. HPM supply piping and tubing and nonmetallic waste lines shall be separated from the corridor and from occupancies other than Group H-5 by fire barriers that have a fire-resistance rating of not less than 1 hour. Where gypsum wallboard is used, joints on the piping side of the enclosure are not required to be taped, provided the joints occur over framing members. Access openings into the enclosure shall be protected by approved fire-resistance-rated assemblies.
5. Readily accessible manual or automatic remotely activated fail-safe emergency shutoff valves shall be installed on piping and tubing other than waste lines at the following locations:
  - 5.1. At branch connections into the fabrication area.
  - 5.2. At entries into exit access corridors.

**Exception:** Transverse crossings of the corridors by supply piping that is enclosed within a ferrous pipe or tube for the width of the corridor need not comply with Items 1 through 5.

**415.8.6.4 Identification.** Piping, tubing and HPM waste lines shall be identified in accordance with ANSI A13.1 to indicate the material being transported.

**415.8.7 Continuous gas-detection systems.** A continuous gas-detection system shall be provided for HPM gases when the physiological warning threshold level of the gas is at a higher level than the accepted permissible exposure limit (PEL) for the gas and for flammable gases in accordance with this section.

**415.8.7.1 Where required.** A continuous gas-detection system shall be provided in the areas identified in Sections 415.8.7.1.1 through 415.8.7.1.4.

**415.8.7.1.1 Fabrication areas.** A continuous gas-detection system shall be provided in fabrication areas when gas is used in the fabrication area.

**415.8.7.1.2 HPM rooms.** A continuous gas-detection system shall be provided in HPM rooms when gas is used in the room.

**415.8.7.1.3 Gas cabinets, exhausted enclosures and gas rooms.** A continuous gas-detection system shall be provided in gas cabinets and exhausted enclosures. A continuous gas-detection system shall be provided in gas rooms when gases are not located in gas cabinets or exhausted enclosures.

**415.8.7.1.4 Corridors.** When gases are transported in piping placed within the space defined by the walls of a corridor, and the floor or roof above the corridor, a continuous gas-detection system shall be provided where piping is located and in the corridor.

**Exception:** A continuous gas-detection system is not required for occasional transverse crossings of the corridors by supply piping that is enclosed in a ferrous pipe or tube for the width of the corridor.

**415.8.7.2 Gas-detection system operation.** The continuous gas-detection system shall be capable of monitoring the room, area or equipment in which the gas is located at or below all the following gas concentrations:

1. Immediately dangerous to life and health (IDLH) values when the monitoring point is within an exhausted enclosure, ventilated enclosure or gas cabinet.
2. Permissible exposure limit (PEL) levels when the monitoring point is in an area outside an exhausted enclosure, ventilated enclosure or gas cabinet.
3. For flammable gases, the monitoring detection threshold level shall be vapor concentrations in excess of 25 percent of the lower flammable limit (LFL) when the monitoring is within or outside an exhausted enclosure, ventilated enclosure or gas cabinet.
4. Except as noted in this section, monitoring for highly toxic and toxic gases shall also comply with Chapter 37 of the *New York City Fire Code*.

**415.8.7.2.1 Alarms.** The gas detection system shall initiate a local alarm and transmit a signal to the emergency control station when a short-term hazard condition is detected. The alarm shall be both visual and audible and shall provide warning both inside and outside the area where the gas is detected.

**415.8.7.2.2 Shutoff of gas supply.** The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for which gas is detected when a short-term hazard condition is detected. Automatic closure of shutoff valves shall comply with the following:

1. Where the gas-detection sampling point initiating the gas detection system alarm is within

a gas cabinet or exhausted enclosure, the shut-off valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.

2. Where the gas-detection sampling point initiating the gas detection system alarm is within a room and compressed gas containers are not in gas cabinets or an exhausted enclosure, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve supplying the manifold for the compressed gas container of the specific gas detected shall automatically close.

**Exception:** Where the gas-detection sampling point initiating the gas detection system alarm is at the use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve for the branch line located in the piping distribution manifold enclosure shall automatically close.

**415.8.8 Manual fire alarm system.** An approved manual fire alarm system shall be provided throughout buildings containing Group H-5. Activation of the alarm system shall initiate a local alarm and transmit a signal to the emergency control station. The fire alarm system shall be designed and installed in accordance with Section 907.

**415.8.9 Emergency control station.** An emergency control station shall be provided in accordance with Sections 415.8.9.1 through 415.8.9.3.

**415.8.9.1 Location.** The emergency control station shall be located on the premises at an approved location outside the fabrication area.

**415.8.9.2 Staffing.** Trained personnel shall continuously staff the emergency control station.

**415.8.9.3 Signals.** The emergency control station shall monitor signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include the following systems, whether required by this code or the *New York City Construction Codes* or voluntarily installed:

1. Automatic sprinkler system alarm and monitoring systems.
2. Manual fire alarm systems.
3. Emergency alarm systems.
4. Continuous gas detection systems.
5. Smoke detection systems.
6. Emergency power system.
7. Automatic detection and alarm systems for pyrophoric liquids and Class 3 water-reactive liquids

required in Section 1803 of the *New York City Fire Code*. NYC

8. Exhaust ventilation flow alarm devices for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust ventilation systems required in Section 1803 of the *New York City Fire Code*. NYC

**415.8.10 Emergency power system.** An emergency power system shall be provided in Group H-5 occupancies where required in Section 415.8.10.1. The emergency power system shall be designed to supply power automatically to required electrical systems when the normal electrical supply system is interrupted.

**415.8.10.1 Required electrical systems.** Emergency power shall be provided for electrically operated equipment and connected control circuits for the following systems:

1. HPM exhaust ventilation systems.
2. HPM gas cabinet ventilation systems.
3. HPM exhausted enclosure ventilation systems.
4. HPM gas room ventilation systems.
5. HPM gas detection systems.
6. Emergency alarm systems.
7. Manual fire alarm systems.
8. Automatic sprinkler system monitoring and alarm systems.
9. Automatic alarm and detection systems for pyrophoric liquids and Class 3 water-reactive liquids required in Section 1803 of the *New York City Fire Code*. NYC  
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10. Flow alarm switches for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust ventilation systems required in Section 1803 of the *New York City Fire Code*. NYC  
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11. Electrically operated systems required elsewhere in this code applicable to the use, storage or handling of HPM. NYC

**415.8.10.2 Exhaust ventilation systems.** Exhaust ventilation systems are allowed to be designed to operate at not less than one-half the normal fan speed on the emergency power system where it is demonstrated that the level of exhaust will maintain a safe atmosphere.

**415.8.11 Automatic sprinkler system protection in exhaust ducts for HPM.**

**415.8.11.1 Exhaust ducts for HPM.** An approved automatic fire sprinkler system shall be provided in exhaust ducts conveying vapors, fumes, mists or dusts generated from HPM in accordance with this section and the *New York City Mechanical Code*. NYC  
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**415.8.11.2 Metallic and noncombustible, nonmetallic exhaust ducts.** An approved automatic sprinkler shall be provided in metallic and noncombustible, non-

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metallic exhaust ducts when all of the following conditions apply:

1. Where the largest cross-sectional diameter is equal to or greater than 10 inches (254 mm).
2. The ducts are within the building.
3. The ducts are conveying flammable gases, vapors or fumes.

**415.8.11.3 Combustible nonmetallic exhaust ducts.** Automatic fire sprinkler system protection shall be provided in combustible nonmetallic exhaust ducts where the largest cross-sectional diameter of the duct is equal to or greater than 10 inches (254 mm).

**Exceptions:**

1. Ducts listed or approved for applications without automatic fire sprinkler system protection.
2. Ducts not more than 12 feet (3658 mm) in length installed below ceiling level.

**415.8.11.4 Automatic sprinkler locations.** Sprinkler systems shall be installed at 12-foot (3658 mm) intervals in horizontal ducts and at changes in direction. In vertical ducts, sprinklers shall be installed at the top and at alternate floor levels.

## SECTION BC 416 APPLICATION OF FLAMMABLE FINISHES

**416.1 General.** The provisions of this section shall apply to the construction, installation and use of buildings and structures, or parts thereof, for the spraying of flammable paints, varnishes and lacquers or other flammable materials or mixtures or compounds used for painting, varnishing, staining or similar purposes. Such construction and equipment shall comply with the *New York City Fire Code*.

**416.2 Spray rooms.** Spray rooms shall be enclosed with fire barriers constructed in accordance with Section 707, horizontal assemblies constructed in accordance with Section 712, or both. The enclosure shall be at least 2-hour fire-resistance-rated. Floors shall be waterproofed and drained in an approved manner.

**416.2.1 Surfaces.** The interior surfaces of spray rooms shall be smooth and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning, and shall be so designed to confine residues within the room. Aluminum shall not be used.

**416.3 Spraying spaces.** Spraying spaces shall be ventilated with an exhaust system capable of at least six air changes per hour to prevent the accumulation of flammable mist or vapors in accordance with the *New York City Mechanical Code*. Where such spaces are not separately enclosed, non-combustible spray curtains shall be provided to restrict the spread of flammable vapors.

**416.3.1 Surfaces.** The interior surfaces of spraying spaces shall be smooth and continuous without edges, and shall be so constructed to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and

cleaning, and shall be so designed to confine residues within the spraying space. Aluminum shall not be used.

**416.4 Spray booths.** Spray booths shall be designed, constructed and operated in accordance with the *New York City Fire Code*.

**416.5 Fire protection.** An automatic fire-extinguishing system shall be provided in all spray, dip and immersing spaces and storage rooms, and shall be installed in accordance with Chapter 9.

## SECTION BC 417 DRYING ROOMS

**417.1 General.** A drying room or dry kiln installed within a building shall be constructed entirely of approved noncombustible materials or assemblies of such materials regulated by the approved rules or as required in the general and specific sections of Chapter 4 for special occupancies, where applicable to the general requirements of Chapter 28, and in accordance with the *New York City Fire Code*.

**417.2 Piping clearance.** Overhead heating pipes shall have a clearance of not less than 2 inches (51 mm) from combustible contents in the dryer.

**417.3 Insulation.** Where the operating temperature of the dryer is 175°F (79°C) or more, metal enclosures shall be insulated from adjacent combustible materials by not less than 12 inches (305 mm) of airspace, or the metal walls shall be lined with 1/4-inch (6.4 mm) insulating mill board or other approved equivalent insulation.

**417.4 Fire protection.** Drying rooms designed for high-hazard materials and processes, including special occupancies as provided for in Chapter 4, shall be protected by an approved automatic sprinkler or fire-extinguishing system conforming to the provisions of Chapter 9.

## SECTION BC 418 ORGANIC COATINGS

**418.1 Building features.** Manufacturing of organic coatings shall be done only in buildings that do not have pits or basements and shall comply with the *New York City Fire Code*. Such buildings shall be protected by an approved automatic sprinkler system in accordance with Chapter 9 of this code.

**418.2 Location.** Organic coating manufacturing operations and operations incidental to or connected therewith shall not be located in buildings having other occupancies.

**418.3 Process mills.** Mills operating with close clearances and that process flammable and heat-sensitive materials, such as nitrocellulose, shall be classified as Group H-1 occupancy.

**418.4 Tank storage.** Storage areas for flammable and combustible liquid tanks inside of structures shall be located at or above grade and shall be separated from the processing area by not less than 2-hour fire-resistance-rated fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**418.5 Nitrocellulose storage.** Nitrocellulose storage shall be located on a detached pad or in a separate structure or a room

**418.6 Finished products.** Storage rooms for finished products that are flammable or combustible liquids shall be separated from the processing area by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both having a fire-resistance rating of at least 2 hours, and openings in the walls shall be protected with approved opening protectives.

**422.5 Automatic sprinkler systems.** Automatic sprinkler systems shall be provided for ambulatory care facilities in accordance with Section 903.2.2.

**422.6 Fire alarm systems.** A fire alarm system shall be provided in accordance with Section 907.2.2.1.

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**SECTION BC 420**  
**GROUPS I-1, R-1, R-2, R-3**

**420.1 General.** Occupancies in Groups I-1, R-1, R-2 and R-3 shall comply with the provisions of this section and other applicable provisions of this code.

**420.2 Separation walls.** Walls separating dwelling units in the same building, walls separating sleeping units in the same building and walls separating dwelling or sleeping units from other occupancies contiguous to them in the same building shall be constructed as fire barriers constructed in accordance with Section 707 and shall be at least 1-hour fire-resistance-rated.

**420.3 Horizontal separation.** Floor assemblies separating dwelling units in the same buildings, floor assemblies separating sleeping units in the same building and floor assemblies separating dwelling or sleeping units from other occupancies contiguous to them in the same building shall be constructed as horizontal assemblies in accordance with Section 712.

**SECTION BC 421  
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## SECTION BC 422

### AMBULATORY HEALTH CARE FACILITIES

**422.1 General.** Occupancies classified as Group B ambulatory health care facilities shall comply with the provisions of Sections 422.1 through 422.6 and other applicable provisions of this code.

**422.2 Smoke barriers.** Smoke barriers shall be provided to subdivide every ambulatory care facility greater than 10,000 square feet (929 m<sup>2</sup>) into a minimum of two smoke compartments per story. The travel distance from any point in a smoke compartment to a smoke barrier door shall not exceed 200 feet (60 960 mm). The smoke barrier shall be installed in accordance with Section 710.

**422.3 Refuge area.** At least 30 net square feet (2.8 m<sup>2</sup>) per nonambulatory patient shall be provided within the aggregate area of corridors, patient rooms, treatment rooms, lounge or dining areas and other low-hazard areas on each side of each smoke barrier.

## SECTION BC 423 STORM SHELTERS

**423.1 General.** In addition to other applicable requirements in this code, storm shelters shall be constructed in accordance with ICC-500.

**423.1.1 Scope.** This section applies to the construction of storm shelters constructed as separate detached buildings or constructed as safe rooms within buildings for the purpose of providing safe refuge from storms that produce high winds, such as tornados and hurricanes. Such structures shall be designated to be hurricane shelters, tornado shelters, or combined hurricane and tornado shelters.

**423.2 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**STORM SHELTER.** A building, structure or portions(s) thereof, constructed in accordance with ICC 500 and designated for use during a severe wind storm event, such as a hurricane or tornado.

**COMMUNITY STORM SHELTER.** A storm shelter not defined as a “Residential storm shelter.”

**RESIDENTIAL STORM SHELTER.** A storm shelter serving occupants of dwelling units and having an occupant load not exceeding 16 persons.†

**SECTION BC 424**  
**NONPRODUCTION CHEMICAL LABORATORIES**

**424.1 General.** The provisions of this section shall govern the design, construction and chemical quantity limitations of buildings and portions thereof occupied or designed to be occupied as a nonproduction laboratory. Nonproduction laboratories shall be classified into occupancy groups in accordance with Section 424.5. The provisions of this section shall not apply to production laboratories classified in Occupancy Group F or H.

**424.2 Standards.** Except as otherwise provided in this section, nonproduction laboratories shall meet the design, construction and chemical quantity limitation requirements for laboratory unit fire hazard Class D, as set forth in NFPA 45, and the *New York City Mechanical Code*. The storage arrangement, handling and use of chemicals within nonproduction laboratories and accessory storage rooms, and the operation and maintenance of nonproduction laboratories shall comply with the requirements of the *New York City Fire Code*, and the rules of the fire commissioner.



**424.3 Prohibitions.** It shall be unlawful in any nonproduction laboratory to:

1. Store or use any explosive.
2. Store or use any unclassified detonable organic peroxide, detonable pyrophoric material, detonable unstable (reactive) material or detonable water-reactive material.
3. Store or use any Class 4 unstable (reactive) material.
4. Store or use any Class 4 oxidizing material.
5. Store or use any flammable gas below grade.

**424.4 Definitions.** The following words and terms shall, for the purposes of this section, and as used elsewhere in this code, have the meanings shown herein.

**LABORATORY BUILDING.** A structure consisting wholly or principally of one or more laboratory units.

**LABORATORY CHEMICAL.** A material with a health, flammability, or instability hazard rating of 2, 3, or 4 as defined in NFPA 704.

**LABORATORY, NONPRODUCTION.** A building or portion thereof wherein chemicals or gases are used or synthesized on a nonproduction basis for testing, research, experimental, instructional or educational purposes.

**LABORATORY UNIT.** An enclosed space of a minimum 1-hour fire-rated construction, designed or used as a nonproduction laboratory. Laboratory units may include one or more separate laboratory work areas, and accessory storage rooms or spaces within or contiguous with the laboratory unit, such as offices and lavatories.

**STORAGE CABINET.** A cabinet designed and constructed in accordance with UL 1275, and used for the storage of not more than 60 gallons (227 L) of flammable and combustible liquids.

**STORAGE ROOM.** A room where laboratory chemicals or gases are stored and not otherwise used or synthesized.

**424.5 Classification.** Buildings or portions thereof occupied as a nonproduction laboratory may be classified as a Group B occupancy provided they comply with the provisions of Section 424. Nonproduction laboratories not in compliance with the provisions of Section 424.7 for laboratory chemical quantity limitations shall be classified as Group H occupancy.

**424.5.1 Accessory use nonproduction laboratories.**

Accessory use nonproduction laboratories occupying an area not more than 10 percent of the area of the story in which such laboratories are located and not exceeding the tabular values in Table 503 for the allowable height or area for such use shall be classified according to the main occupancy. Such accessory nonproduction laboratories shall comply with the provisions of Section 424.

**424.6 Fire protection.**

**424.6.1 Sprinkler system.** Laboratory units shall be provided throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The entire building shall be provided throughout with an automatic sprinkler system when the aggregate floor area of all laboratory

units within any building exceeds 20,000 square feet (1858 m<sup>2</sup>).

**424.6.2 Standpipe and hose system.** In all nonproduction laboratory buildings that are two or more stories above or below the grade level (level of exit discharge), standpipes shall be installed in accordance with Section 905.2.

**424.6.3 Fire alarm system.** A manual fire alarm system shall be installed in accordance with Section 907.2.2, 907.2.3, or 907.2.6, as applicable.

**424.7 Quantity limitations.**

**424.7.1 Flammable and combustible liquids.** The density and total quantity of flammable and combustible liquids allowed within a laboratory unit, outside of storage rooms, shall comply with Table 10.1.1 of NFPA 45 for laboratory unit fire hazard Class D.

**Exceptions:** The following exceptions apply to other than educational or instructional laboratories:

1. The density of flammable and combustible liquids allowed within a laboratory unit may be increased to those set forth in Table 10.1.1 of NFPA 45 for laboratory unit fire hazard Class B provided the total quantity of flammable and combustible liquid, including any in storage cabinets or safety cans, does not exceed 25 gallons (95 L).
2. The density of flammable and combustible liquids allowed within a laboratory unit may be increased to those set forth in Table 10.1.1 of NFPA 45 for laboratory unit fire hazard Class B provided the total quantity of flammable and combustible liquid, including any in storage cabinets or safety cans, does not exceed 30 gallons (114 L) and the walls, floors and ceilings of the laboratory unit are separated from all adjoining areas by 2-hour fire-rated construction.
3. Based on a density of 1 gallon per 100 square feet (3.785 L per 9.3 m<sup>2</sup>) of area, the quantity of flammable and combustible liquid allowed within a laboratory unit, excluding quantities in storage cabinets or safety cans, may be increased to 100 gallons (379 L), and the total quantities of flammable and combustible liquids, including quantities in storage cabinets or safety cans, may be increased to 200 gallons (775 L) provided the walls, floors and ceilings of the laboratory unit are separated from all adjoining areas by 2-hour fire-rated construction.

**424.7.2 Flammable solids.** The total quantity of flammable solids allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 10 pounds (4.5 kg).

**Exception:** The total quantity of flammable solids allowed within a laboratory unit that is provided with walls, floors and ceilings that separate the laboratory unit from all adjoining areas by 2-hour fire-rated construction shall not exceed 15 pounds (6.8 kg).

**424.7.3 Oxidizers and organic peroxides.** The total quantity of solid and liquid oxidizers and organic peroxides combined allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 40 pounds (18 kg), provided not more than 2 pounds (0.908 kg) of which are Class 3 oxidizers and 1 pound (0.454 kg) of which is Class I organic peroxides.

**Exception:** The total quantity of solid and liquid oxidizers and organic peroxides combined allowed within a laboratory unit that is provided with walls, floors and ceilings that separate the laboratory unit from all adjoining areas by 2-hour fire rated construction shall not exceed 50 pounds (23 kg), provided not more than 2 pounds (0.908 kg) of which is Class 3 oxidizers and 1 pound (0.454 kg) of which are Class I organic peroxides.

**424.7.4 Unstable (reactive).** The total quantity of unstable (reactive) material allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 6 pounds (2.7 kg), provided not more than 1 pound (0.454 kg) of which is Class 3 unstable (reactive).

**Exception:** The total quantity of unstable (reactive) material allowed within a laboratory unit that is provided with walls, floors and ceilings that separate the laboratory unit from all adjoining areas by 2-hour fire-rated construction shall not exceed 12 pounds (5.4 kg), provided not more than 1 pound (0.454 kg) of which is Class 3 unstable (reactive).

**424.7.5 Water reactive material.** The total quantity of water reactive material allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 2.5 pounds (1.1 kg).

**Exception:** The total quantity of water-reactive material allowed within a laboratory unit that is provided with walls, floors and ceilings that separate the laboratory unit from all adjoining areas by 2-hour fire-rated construction shall not exceed 5 pounds (2.3 kg).

**424.7.6 Pyrophoric material.** The total quantity of solid or liquid pyrophoric material allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 0.5 pounds (0.227 kg).

**Exception:** The total quantity of pyrophoric material allowed within a laboratory unit that is provided with walls, floors and ceilings that separate the laboratory unit from all adjoining areas by 2-hour fire rated construction shall not exceed 1 pound (0.454 kg).

**424.7.7 Highly toxic material.** The total quantity of solid or liquid highly toxic material allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 5 pounds (0.227 kg).

**424.7.8 Toxic material.** The total quantity of solid or liquid toxic material allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 250 pounds (946 L).

**424.7.9 Corrosive material.** The total quantity of solid or liquid corrosive material allowed within a laboratory unit, excluding any quantity in a storage room, shall not exceed 250 gallons (946 L).

**424.7.10 Highly toxic and toxic gases.** In educational and instructional laboratories, the total quantity of highly toxic and toxic gases combined allowed within a laboratory unit, excluding any quantities in a storage room, shall not exceed 20 standard cubic feet (0.56 standard cubic m).

**424.8 Storage room classification.** Storage rooms for laboratory chemicals accessory to a laboratory unit shall be classified as Occupancy Group S-1 provided they comply with the provisions of Section 424.9. Storage rooms not in compliance with the provisions of Section 424.9 for laboratory chemical quantity limitations shall be classified as a Group H occupancy.

**424.9 Storage rooms.** In addition to the quantities allowed within a laboratory unit by Section 424.7, laboratory chemicals that are accessory to a laboratory unit may be stored, whether outside of or entirely within a laboratory unit, in dedicated storage rooms complying with all of the following:

1. Storage room capacity shall be limited to a maximum of 300 gallons (1136 L) of laboratory chemicals, not to exceed 5 gallons per square foot (0.125 L/m<sup>2</sup>) of floor area.
2. Flammable gas storage rooms shall be limited to 2,500 standard cubic feet (71 standard cubic m) of flammable gas.
3. Storage rooms shall be enclosed by a minimum of 2-hour rated fire barriers.
4. Storage rooms shall be equipped with a continuously operated ventilation system that provides at least 6 changes of air per hour and vents to the outdoors.
5. Each entrance to the storage room shall be provided with a minimum 1½-hour rated self-closing fire door.
6. Each entrance to the storage room shall be provided with a sill at the doorway, except that no sill shall be required in storage rooms containing only flammable gases.
7. Storage rooms shall be equipped with an automatic sprinkler system providing at least one sprinkler for each 90 square feet (8.4 m<sup>2</sup>) or portion thereof.
8. Laboratory chemicals that are incompatible with each other shall not be stored in the same storage room unless in compliance with the *New York City Fire Code* for separation of incompatible materials.
9. Storage rooms shall not open directly to an exit or any enclosed exit access component.
10. The floor of any storage room storing flammable gases shall be located at or above grade.

**424.10 Ventilation.** Nonproduction laboratories shall be ventilated in accordance with Section 407 of the *New York City Mechanical Code*.

## SECTION BC 425 USES AND OCCUPANCIES INVOLVING RADIOACTIVE MATERIALS AND RADIATION-PRODUCING EQUIPMENT

**425.1 Scope.** This section shall apply to the construction, alteration, and use of buildings or spaces for radioactive materials and radiation-producing equipment.

**425.2 City, state and federal regulations.** In addition to the requirements of this section, occupancies involving radioactive materials and radiation-producing equipment shall also comply with applicable requirements of the city health code, and applicable state and federal regulations.

**425.3 Laboratories.** All laboratories utilizing radioactive materials or radiation-producing equipment required to register under the requirements of the *New York City Health Code* shall comply with the requirements of Sections 425.3.1 through 425.3.7.

**425.3.1 Construction.** All buildings in which such laboratories occur shall be of Group I or II construction.

**425.3.2 Floors.** All floors shall comply with the fire resistance requirements for the class of construction, and provide the degree of radioactive resistance required by applicable city, state, and federal regulations. A finished material shall be applied to provide a continuous nonporous surface, which may be readily removed.

**425.3.3 Interior finish.** All insulation of acoustical treatments and interior partitions shall be of noncombustible material. Walls and ceilings shall have nonporous finishes of Class A rating.

**425.3.4 Sprinkler protection.** Automatic sprinkler protection complying with the construction provisions of Chapter 9 of the *New York City Building Code* shall be provided, and such protection shall be designed for the type of combustible materials wherever such material is used, and for the radioactive material that may be expected to melt, vaporize, or oxidize under fire conditions. Laboratory equipment susceptible to damage from water or other materials used in the sprinkler system may be shielded by hoods except when the equipment provides a source of combustion. Where sprinkler protection uses water, or small water-spray installations are used to fight small isolated fires, floors shall be provided with drainage so that water may be carried to retention tanks for later disposal as required by the *New York City Health Code* when contamination of the water is to be anticipated.

**425.3.5 Electrical controls.** Electrical controls and equipment shall be installed in accordance with the requirements of the *New York City Electrical Code*.

**425.3.6 Ventilation.** Exhaust air from areas in which radioactive materials are used or stored shall be exhausted to the outdoors in such manner as not to create a health hazard, and shall not be recirculated to other areas of the building. Air pressure in rooms in which radioactive materials are used or stored shall be maintained below the

air pressure of adjoining rooms, so that there is no flow of radioactive gases or dusts into adjoining rooms.

**425.3.6.1 Ducts.** Ducts shall be of sheet steel of not less than No. 16 manufacturers' standard gauge or of other equivalent noncombustible material having a melting point above 1800°F (982°C). Exhaust ducts within the building, on the discharge side of the fan, shall be welded airtight. Exhaust ducts within the building, on the suction side of the fan, shall have laps in the direction of airflow with smoke-tight joints, and shall be subjected to a smoke test in accordance with the requirements for chimneys in the *New York City Mechanical Code*. Access hatches with tight-closing covers shall be provided for cleaning and for fire-fighting in the exhaust system ducts.

**425.3.6.2 Fume hoods.** Fume hoods shall be exhausted to the outdoors. Controls for hood fans shall be interlocked so that contaminated air cannot be drawn into any space from a hood where the exhaust fan is not in operation.

**425.3.6.3 Fans.** Fan equipment other than the impeller and impeller housing shall be located outside the exhaust stream.

**425.3.6.4 Exhaust.** When the degree of contamination of the exhaust stream exceeds the concentration limits permitted by the health code, the duct system shall be equipped with devices to decontaminate the air to a safe level before discharging to the outdoor air.

**425.3.7 Plumbing.** Drainage lines from sinks used for radioactive wastes shall be without traps, and shall lead to retention tanks when required by the provisions of the *New York City Health Code*.

**425.4 Radiation machines.** Radiation machines or particle accelerators, linear accelerators, cyclotrons, synchrotrons, betatrons, or bevatrons shall be located only in buildings of Group I or II construction; however, this requirement shall not apply to conventional medical, dental, research, or industrial x-ray machines of less than one million-volt capacity.

**425.5 Storage.** Radioactive materials shall be stored in sealed containers. When required by the commissioner to avoid too concentrated an exposure within any one space, radioactive materials shall be stored in vaults designed in accordance with the radiation shielding or other requirements for the materials to be stored, and with the requirements of Sections 425.5.1 through 425.5.3.

**425.5.1 Fire protection.** When any materials are subject to melting, vaporization, or oxidation under fire conditions, the storage vaults shall be constructed of walls having a fire-resistance rating of at least 4 hours, and the vaults shall be equipped with automatic sprinklers complying with the construction requirements of Chapter 9 and shall be vented through devices to decontaminate the air to a safe level.

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**425.5.2 Doors.** Doors opening into storage vaults shall meet shielding requirements and have a fire-protection rating of not less than 3 hours.

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**425.5.3 Bins, shelving, partitions and pallets.** All bins, shelving, partitions, and pallets in storage vaults shall be of noncombustible materials. Other methods of storage permitted by the health department or applicable state and federal regulations, such as storage under water, may be used.





## CHAPTER 5

# GENERAL BUILDING HEIGHTS AND AREAS; SEPARATION OF OCCUPANCIES

### SECTION BC 501 GENERAL

**501.1 Scope.** The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures, including separation of occupancies.

**501.2 Address identification.** Buildings shall be provided with address numbers or letters in accordance with Section 23-505 of the *Administrative Code* and the rules issued thereunder by the borough president of the borough in which the property is located. Except as otherwise provided by the rules of the borough president in which the property is located, characters shall be a minimum 4 inches (102 mm) high and a minimum of 0.5 inch (12.7 mm) wide. They shall be installed on a contrasting background and be plainly visible from the street or road fronting the property. Where access is by means of a private road and the building address cannot be viewed from the public way, an appropriately placed monument, pole or sign or any other means authorized by the borough president of the borough in which the property is located shall be used to identify the structure.

#### 501.3 Fire Department access.

**501.3.1 Frontage.** Every building, exclusive of accessory buildings, shall have at least 8 percent of the total perimeter of the building adjoining a street or frontage space. For the purposes of this section, building perimeter shall be measured at that story having the maximum enclosed floor area; and buildings provided with a front yard or front setback no deeper than 30 feet (9144 mm) in compliance with the *New York City Zoning Resolution* shall be considered as adjoining the street or frontage space.

**501.3.2 Building access.** Provisions shall be made for access by the Fire Department to every building in accordance with Section 903.2.11.1 of this code and Chapter 5 of the *New York City Fire Code*. In addition, multiple dwellings shall comply with Section 54 of the *New York State Multiple Dwelling Law*, as applicable.

### SECTION BC 502 DEFINITIONS

**502.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**AREA, BUILDING.** The area included within surrounding exterior walls (or exterior walls and firewalls) exclusive of vent shafts and courts. Areas of the building not provided with surrounding walls shall be included in the building area if such areas are included within the horizontal projection of the roof or floor above.

**BASEMENT.** A story partly below the grade plane and having less than one-half its clear height (measured from finished floor to finished ceiling) below the grade plane (see “Story” in Section 202 and “Story above grade plane” in this section). A basement shall be considered a story above grade plane.

**CELLAR.** That portion of a building that is partly or wholly underground, and having one-half or more of its clear height (measured from finished floor to finished ceiling) below the grade plane. Cellars shall not be counted as stories in measuring the height of the buildings.

**COMBINED HEAT AND POWER SYSTEMS.** Equipment that simultaneously produces electricity and heat from a single fuel source.

**EQUIPMENT PLATFORM.** An unoccupied, elevated platform used exclusively for mechanical systems or industrial process equipment, including the associated elevated walkways, stairs, alternating tread devices and ladders necessary to access the platform (see Section 505.5).

**FRONTAGE SPACE.** A street or an open space adjoining a building not less than 30 feet (9144 mm) in any dimension. Such open space shall be accessible from a street by a driveway, lane, private road or alley at least 20 feet (6096 mm) in width. Such open space including accessways shall be permanently maintained free of all obstructions that might interfere with its use by the Fire Department.

**GRADE PLANE.** A reference plane representing the level of the curb as established by the city engineer in the Borough President’s office, measured at the center of the front of a building. Where a building faces on more than one street, the grade plane shall be the average of the levels of the curbs at the center of each front.

**Exception:** The grade plane shall not be referenced to the level of the curb, but shall be considered the average elevation of the final grade adjoining all exterior walls of a building, calculated from final grade elevations taken at intervals of 10 feet (3048 mm) around the perimeter of the building where:

1. No curb elevation has been legally established on the city map; or
2. Every part of the building is setback more than 25 feet (7620 mm) from a street line.

**HEIGHT, BUILDING.** The vertical distance from the grade plane to the average height of the highest roof surfaces.

**MEZZANINE.** An intermediate level or levels between the floor and ceiling of any story in accordance with Section 505.

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STORY ABOVE GRADE PLANE. Any story having its finished floor surface entirely above grade plane, except that a basement shall also be considered a story above grade plane (also see definitions of "Story" in Section BC 202 and "Basement" in this section).

### SECTION BC 503 GENERAL BUILDING HEIGHT AND AREA LIMITATIONS

**503.1 General.** The building height and area shall not exceed the limits specified in Table 503 based on the type of construction as determined by Section 602 and the occupancies as determined by Section 302 except as modified hereafter. Each portion of a building separated by one or more fire walls complying with Section 706 shall be considered to be a separate building.

**503.1.1 Special industrial occupancies.** Buildings and structures of Type I and II construction designed to house special industrial processes that require large areas and unusual building heights to accommodate craneways or special machinery and equipment including, among others, rolling mills; structural metal fabrication shops and

foundries; or the production and distribution of electric, gas or steam power, shall be exempt from the building height and area limitations of Table 503.

**503.1.2 Buildings on same tax lot.** Two or more buildings on the same tax lot and under the same ownership and control shall be regulated as separate buildings, or, at the option of the owner, shall be considered as portions of one building if the building height of each building and the aggregate building area of the combined buildings are within the limitations of Table 503 as modified by Sections 504 and 506. The provisions of this code applicable to the aggregate building shall be applicable to each building.

**503.1.3 Type I construction.** Buildings of Type I construction permitted to be of unlimited tabular building heights and areas in accordance with Table 503 are not required to comply with the special requirements that allow unlimited area buildings in Section 507 or unlimited building height in Sections 503.1.1 and 504.3 or increased building heights and areas for other types of construction.

**503.2 Reserved.**

**TABLE 503**  
**ALLOWABLE BUILDING HEIGHTS AND AREAS<sup>a</sup>**  
Building height limitations shown in feet above grade plane. Story limitations shown as stories above grade plane.  
Building area limitations shown in square feet, as determined by the definition of "Area, building," per story.

GROUP		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	HEIGHT (feet) HEIGHT(S)	UL	160°	65	55	65	55	65	50	40
A-1	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	17,500	10,500	14,700	5,600	15,000	8,400	5,500
A-2	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	17,500	9,500	14,000	5,600	15,000	8,400	5,500
A-3	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	17,500	9,500	14,000	5,600	15,000	8,400	5,500
A-4	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	17,500	9,500	14,000	5,600	15,000	8,400	5,500
A-5	S	UL	UL	UL	UL	UL	UL	6	UL	UL
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	37,500	10,500	28,500	5,600	36,000	8,400	5,500
E	S	UL	UL	4	3	4	3	6	3	2
	A	UL	UL	26,000	10,500	23,500	5,600	25,500	8,400	5,500
F-1	S	UL	6	5	3	5	2	5	3	2
	A	UL	UL	12,500	7,500	7,500	3,000	10,000	3,000	1,000
F-2	S	UL	UL	6	3	6	3	6	3	2
	A	UL	UL	37,500	10,500	28,500	5,600	30,000	8,400	5,500
H-1	S	1	1	1	1	1	1	1	1	NP
	A	21,000	16,500	11,000	7,500	9,500	7,000	10,500	7,500	NP
H-2 <sup>d</sup>	S	UL	3	2	1	2	1	2	1	1
	A	21,000	16,500	11,000	7,500	9,500	7,000	10,500	7,500	3,000
H-3 <sup>d</sup>	S	UL	6	4	2	4	2	4	2	1
	A	UL	60,000	26,500	14,000	17,500	13,000	25,000	10,000	5,000

(continued)

**TABLE 503—continued**  
**ALLOWABLE BUILDING HEIGHTS AND AREAS<sup>a</sup>**  
 Building height limitations shown in feet above grade plane. Story limitations shown as stories above grade plane.  
 Building area limitations shown in square feet, as determined by the definition of “Area, building,” per story.

GROUP		TYPE OF CONSTRUCTION									NYC
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V		
		A	B	A	B	A	B	HT	A	B	
	HEIGHT (feet) HEIGHT(S)	UL	160°	65	55	65	55	65	50	40	
H-4	S A	UL UL	7 UL	5 37,500	3 17,500	5 28,500	3 17,500	5 36,000	3 18,000	2 6,500	NYC
H-5	S A	3 UL	3 UL	3 37,500	3 23,000	3 28,500	3 19,000	3 36,000	3 18,000	2 9,000	NYC
I-1	S A	UL UL	UL UL	6 19,000	NP NP	4 16,500	3 5,600	4 18,000	NP NP	NP NP	NYC
I-2	S A	UL UL	6 UL	4 7,000	4 3,500	5 5,000	3 1,200	5 6,500	3 2,000	NP NP	NYC
I-3	S A	UL UL	4 UL	4 7,000	3 3,500	4 5,000	2 1,200	4 6,500	3 2,000	NP NP	NYC
I-4	S A	UL UL	UL UL	3 26,500	3 9,500	3 23,500	3 5,600	3 25,500	2 8,400	2 5,500	NYC
M	S A	UL UL	UL UL	6 21,500	3 7,500	6 18,500	3 5,600	6 14,000	3 8,400	2 5,500	NYC
R-1	S A	UL UL	UL UL	6 UL	NP NP	6 24,000	NP NP	6 20,500	NP NP	NP NP	NYC
R-2	S A	UL UL	UL UL	6 UL	NP NP	6 24,000	3 5,600	6 20,500	NP NP	NP NP	NYC
R-3	S A	UL UL	UL UL	6 17,500	3 10,500	6 14,700	3 5,600	6 30,000	3 8,400	3 5,500	NYC
S-1	S A	UL UL	6 48,000	5 12,000	3 7,500	4 7,500	3 7,500	4 7,500	3 5,000	2 1,000	NYC
S-2 <sup>b, c</sup>	S A	UL UL	UL UL	6 15,000	3 10,000	6 10,000	4 8,500	6 10,000	3 8,400	2 5,500	NYC
U <sup>c</sup>	S A	UL UL	5 35,000	4 19,000	2 8,500	3 14,000	2 8,500	4 18,000	2 9,000	1 5,500	NYC

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

A = building area per story, S = stories above grade plane,

UL = Unlimited, NP = Not permitted.

a. See the following sections for general exceptions to Table 503:

Section 504.2, Allowable height increase due to automatic sprinkler system installation.

Section 506.2, Allowable area increase due to frontage.

Section 506.3, Allowable area increase due to automatic sprinkler system installation.

Section 507, Unlimited area building.

b. For open parking structures, see Section 406.3.

c. For private garages, see Section 406.1.

d. See Section 415.5 for limitations.

e. Except for Occupancy Groups F-1, H-1 through H-5, I-2, I-3, S-1 and U, buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be unlimited in height.

Not permitted in Fire District.

Not permitted in Fire District without sprinklers.

## SECTION BC 504

### BUILDING HEIGHT MODIFICATIONS

**504.1 General.** The heights permitted by Table 503 shall only be increased in accordance with this section.

**Exception:** The building height of one-story aircraft hangars, aircraft paint hangars and buildings used for the manufacturing of aircraft shall not be limited if the build-

ing is provided with an automatic fire-extinguishing system in accordance with Chapter 9 and is entirely surrounded by public ways or yards not less in width than one and one-half times the building height.

**504.2 Automatic sprinkler system increase.** Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the



NYC value specified in Table 503 for maximum building height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one story. These increases are permitted in addition to the building area increase in accordance with Sections 506.2 and 506.3. For Group R buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.2, the value specified in Table 503 for maximum building height is increased by 20 feet (6096 mm) and the maximum number of stories is increased by one story, but shall not exceed 60 feet (18 288 mm) or six stories, respectively.

**Exceptions:**

1. Buildings, or portions of buildings, classified as a Group I-2 occupancy of Type IIB, III, IV or V construction.
2. Buildings, or portions of buildings, classified as a Group H-1, H-2, H-3 or H-5 occupancy.
3. Fire-resistance rating substitution in accordance with Table 601, Note d.

NYC **504.3 Rooftop structures.** Rooftop structures including but not limited to roof tanks and their supports, ventilating, air conditioning, combined heat and power systems and similar building service equipment, bulkheads, penthouses, greenhouses, chimneys, and parapet walls 4 feet (1219 mm) or less in height shall not be included in the building height of the building or considered an additional story unless the aggregate area of all such structures, exclusive of any solar thermal and solar (photovoltaic) collectors and/or panels and their supporting equipment, exceeds  $33\frac{1}{3}$  percent of the area of the roof of the building upon which they are erected. Rooftop structures shall be constructed in accordance with Section 1509.

**Exception:** Solar thermal and solar electric (photovoltaic) collectors and/or panels and their supporting equipment that exceed  $33\frac{1}{3}$  percent of the area of the roof of the building upon which they are erected shall not be included in the height of a building or considered an additional story.

**SECTION BC 505**

**MEZZANINES AND EQUIPMENT PLATFORMS**

NYC **505.1 General.** A mezzanine or mezzanines in compliance with Section 505 shall be considered a portion of the story in which it is contained. Such mezzanines shall not contribute to either the building area or number of stories as regulated by Section 503.1. The area of the mezzanine shall be included in determining the fire area defined in Section 902. The clear height above and below the mezzanine floor construction shall not be less than 7 feet (2134 mm).

NYC **Exception:** The clear height of habitable spaces above or below mezzanines within dwelling units shall not be less than 8 feet (2438 mm).

NYC **505.2 Area limitation.** The aggregate area of a mezzanine or mezzanines within a room or space shall not exceed one-third of the area of that room or space in which they are located. The enclosed portions of a room or space shall not be included in determining the permissible floor area of the

mezzanine. In determining the allowable mezzanine area, the area of the mezzanine shall not be included in the floor area of the room in which it is contained. NYC

**Exceptions:**

1. The aggregate area of mezzanines in buildings and structures of Type I or II construction for special industrial occupancies in accordance with Section 503.1.1 shall not exceed two-thirds of the area of the room. NYC
2. The aggregate area of a mezzanine or mezzanines within a dwelling unit shall not exceed one-third of the net floor area of such dwelling unit, whether or not portions of such dwelling unit are enclosed. The area of the mezzanine shall not contribute to the determination of the floor area of the dwelling unit in which it is contained. NYC

**505.3 Egress.** Each occupant of a mezzanine shall have access to at least two independent means of egress where the common path of egress travel exceeds the limitations of Section 1014.3. Where a stairway provides a means of exit access from a mezzanine, the maximum travel distance includes the distance traveled on the stairway measured in the plane of the tread nosing. Accessible means of egress shall be provided in accordance with Section 1007.

**Exception:** A single means of egress shall be permitted in accordance with Section 1015.1.

**505.4 Openness.** A mezzanine shall be open and unobstructed to the room in which such mezzanine is located except for walls or railings not more than 42 inches (1067 mm) high, columns and posts. NYC

**Exceptions:**

1. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the occupant load of the aggregate area of the enclosed space does not exceed 10.
2. A mezzanine having two or more means of egress is not required to be open to the room in which the mezzanine is located, if at least one of the means of egress provides direct access to an exit from the mezzanine level.
3. Mezzanines or portions thereof are not required to be open to the room in which the mezzanines are located, provided that the aggregate floor area of the enclosed space does not exceed 10 percent of the mezzanine area.
4. In industrial facilities, mezzanines used for control equipment are permitted to be glazed on all sides.
5. A mezzanine having two or more means of egress shall not be required to be open to the room in which the mezzanine is located in occupancies, other than Groups H and I, that comply with items 5.1 through 5.4. NYC
- 5.1. Such occupancy is no more than two stories above grade plane, NYC

- NYC 5.2. Such occupancy is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1,
- NYC 5.3. An approved fire alarm system is installed throughout the entire building or structure in which such occupancy is located, and
- NYC 5.4. Notification appliances are installed throughout the mezzanine in accordance with NFPA 72.

**505.5 Equipment platforms.** Equipment platforms in buildings shall not be considered as a portion of the floor below. Such equipment platforms shall not contribute to either the building area or the number of stories as regulated by Section 503.1. The area of the equipment platform shall not be included in determining the fire area in accordance with Section 903. Equipment platforms shall not be a part of any mezzanine, and such platforms and the walkways, stairs, alternating tread devices and ladders providing access to an equipment platform shall not serve as a part of the means of egress from the building.

NYC **505.5.1 Area limitations.** The aggregate area of all industrial equipment platforms within a room shall not exceed two-thirds of the area of the room in which they occur. Where an equipment platform is located in the same room as a mezzanine, the area of the mezzanine shall be determined by Section 505.2, and the combined aggregate area of the equipment platforms and mezzanines shall not exceed two-thirds of the room in which they are located.

NYC **505.5.2 Fire suppression.** Where located in a building that is required to be protected by an automatic sprinkler system, industrial equipment platforms shall be fully protected by sprinklers above and below the platform, where required by the standards referenced in Section 903.3.

**505.5.3 Guards.** Equipment platforms shall have guards where required by Section 1013.1.

## SECTION BC 506 BUILDING AREA MODIFICATIONS

**506.1 General.** The building areas limited by Table 503 shall be permitted to be increased due to frontage ( $I_f$ ) and automatic sprinkler system protection ( $I_s$ ) in accordance with the following:

$$A_a = [A_t + (A_t \times I_f) + (A_t \times I_s)] \quad \text{(Equation 5-1)}$$

where:

$A_a$  = Allowable building area per story (square feet).

$A_t$  = Tabular building area per story in accordance with Table 503 (square feet).

$I_f$  = Area increase factor due to frontage as calculated in accordance with Section 506.2.

$I_s$  = Area increase factor due to sprinkler protection as calculated in accordance with Section 506.3.

NYC **506.2 Frontage increase.** Where a building has more than 25 percent of its perimeter adjoining a public way or open space having a minimum width of 20 feet (6096 mm), the

frontage increase shall be determined in accordance with the following:

$$I_f = (F/P - 0.25)W/30 \quad \text{(Equation 5-2)}$$

where:

$I_f$  = Area increase factor due to frontage.

NYC

$F$  = Building perimeter that fronts on a public way or open space having 20 feet (6096 mm) open minimum width (feet).

$P$  = Perimeter of entire building (feet).

$W$  = Width of public way or open space (feet) in accordance with Section 506.2.1.

**506.2.1 Width limits.** The value of “W” shall be at least 20 feet (6096 mm). Where the value of  $W$  varies along the perimeter of the building, the calculation performed in accordance with Equation 5-2 shall be based on the weighted average of each portion of exterior wall and open space where the value of  $W$  is greater than or equal to 20 feet (6096 mm). Where  $W$  exceeds 30 feet (9144 mm), a value of 30 feet (9144 mm) shall be used in calculating the weighted average, regardless of the actual width of the open space. Where two or more buildings are on the same tax lot,  $W$  shall be measured from the exterior face of a building to the exterior face of an opposing building, as applicable.

NYC

NYC

**Exception:** The value of  $W$  divided by 30 shall be permitted to be a maximum of 2 when the building meets all requirements of Section 507 except for compliance with the 60-foot (18 288 mm) public way or yard requirement, as applicable.

**506.2.2 Open space limits.** Such open space shall be either on the same zoning lot or dedicated for public use and shall be accessed from a street or approved fire lane.

NYC

**506.3 Automatic sprinkler system increase.** Where a building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1, the building area limitation in Table 503 is permitted to be increased by an additional 200 percent ( $I_s = 2$ ) for buildings with more than one story above grade plane and an additional 300 percent ( $I_s = 3$ ) for buildings with no more than one story above grade plane. These increases are permitted in addition to the height and story increases in accordance with Section 504.2.

**Exceptions:** The building area limitation increases shall not be permitted for the following conditions:

NYC

1. The automatic sprinkler system increase shall not apply to buildings with an occupancy in Group H-1.
2. The automatic sprinkler system increase shall not apply to the building area of an occupancy in Group H-2 or H-3. For buildings containing such occupancies, the allowable building area shall be determined in accordance with Section 508.4.2, with the sprinkler system increase applicable only to the portions of the building not classified as Group H-2 or H-3.
3. Fire-resistance rating substitution in accordance with Table 601, Note d.

**506.4 Single occupancy buildings with more than one story.** The total allowable building area of a single occupancy building with more than one story above grade plane shall be determined in accordance with this section. The actual aggregate building area at all stories in the building shall not exceed the total allowable building area.

**Exception:** A single basement need not be included in the total allowable building area, provided such basement does not exceed the area permitted for a building with no more than one story above grade plane and the finished surface of the floor above the basement does not exceed 6 feet (1829 mm) above grade plane.

**506.4.1 Area determination.** The total allowable building area with more than one story above grade plane shall be determined by multiplying the allowable area per story ( $A_a$ ), as determined in Section 506.1, by the number of stories above grade plane as listed below.

1. For buildings with two stories above grade plane, multiply by 2;
2. For buildings with three or more stories above grade plane, multiply by 3; and
3. No story shall exceed the allowable area per story ( $A_a$ ), as determined in Section 506.1 for the occupancies on that story.

**Exceptions:**

1. Unlimited area buildings in accordance with Section 507.
2. In Group R occupancies 6 stories or less in height, the maximum area of a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2 shall be determined by multiplying the allowable area per story ( $A_a$ ), as determined in Section 506.1, by the number of stories above grade plane.

**506.5 Mixed occupancy area determination.** The total allowable building area for buildings containing mixed occupancies shall be determined in accordance with the applicable provisions of this section.

**Exception:** A single basement need not be included in the total allowable building area, provided such basement does not exceed the area permitted for a building with no more than one story above grade plane and the finished surface of the floor above the basement does not exceed 6 feet (1829 mm) above grade plane.

**506.5.1 No more than one story above grade plane.** For buildings with no more than one story above grade plane and containing mixed occupancies, the total building area shall be determined in accordance with the applicable provisions of Section 508.1.

**506.5.2 No more than one story above grade plane.** For buildings with no more than one story above grade plane and containing mixed occupancies, each story shall individually comply with the applicable requirements of Section 508.1. For buildings with more than three stories above grade plane, the total building area shall be such

that the aggregate sum of the ratios of the actual area of each story divided by the allowable area of such stories based on the applicable provisions of Section 508.1 shall not exceed 3.

## SECTION BC 507 UNLIMITED AREA BUILDINGS

**507.1 General.** The area of buildings of the occupancies and configurations specified in Section 507 shall not be limited.

**507.2 Nonsprinklered, one story.** The area of a Group F-2 or S-2 building no more than one story in height, of other than Type V construction shall not be limited when the building is surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.

**507.3 Sprinklered, one story.** The area of a Group B, F, M or S building no more than one story in height or a Group A-4 building no more than one story in height of other than Type V construction shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 903.3.1.1, and is surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.

**Exceptions:**

1. In Group F-2 and S-2 occupancies, one-story rack storage facilities of Type II construction that are not accessible to the public shall not be limited in height provided that such buildings conform to the requirements of Sections 507.3, 903.3.1.1 of this code and the *New York City Fire Code*.
2. The automatic sprinkler system shall not be required in areas occupied for indoor participant sports, such as tennis, skating, swimming and equestrian activities, in occupancies in Group A-4, provided that:
  - 2.1. Exit doors directly to the outside are provided for occupants of the participant sports areas; and
  - 2.2. The building is equipped with a fire alarm system with manual fire alarm boxes installed in accordance with Section 907.

**507.3.1 Mixed occupancy buildings with Groups A-1 and A-2.** Group A-1 and A-2 occupancies of other than Type V construction shall be permitted within mixed occupancy buildings of unlimited area complying with Section 507.3, provided all of the following are met:

1. Group A-1 and A-2 occupancies are separated from other occupancies as required for separated occupancies in Section 508.4.4 with no reduction allowed in the fire-resistance rating of the separation based upon the installation of an automatic sprinkler system;
2. Each area of the portions of the building used for Group A-1 or A-2 occupancies shall not exceed the maximum allowable area permitted for such occupancies in Section 503.1; and



	3. All exit doors from Group A-1 and A-2 occupancies shall discharge directly to the exterior of the building.	
NYC NYC NYC NYC	<b>507.4 Sprinklered, two story.</b> The area of a Group B, F, M or S building no more than two stories in height shall not be limited when the building is provided with an automatic sprinkler system in accordance with Section 903.3.1.1 throughout, and is surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.	NYC
NYC NYC	<b>507.5 Reduced open space.</b> The public ways or yards of 60 feet (18 288 mm) required in Sections 507.2, 507.3, 507.4 and 507.6 shall be permitted to be reduced to not less than 40 feet (12 192 mm) in width provided all of the following requirements are met:	
	1. The reduced width shall not be allowed for more than 75 percent of the perimeter of the building.	
NYC	2. The exterior wall facing the reduced width shall have a minimum fire-resistance rating of 3 hours.	
NYC NYC NYC NYC NYC NYC NYC NYC	3. Openings in the exterior wall, facing the reduced open space, shall have opening protectives with a minimum fire-resistance rating of 3 hours.	
NYC	<b>507.6 Group A buildings.</b> The area of a Group A-1, A-2, A-3, or A-4 building of Type IIA, IIIA or IV construction shall not be limited where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The area of a one-story, Group A-3 building used as a house of worship, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor swimming pool or tennis court of Type IIB construction shall not be limited when all of the following criteria are met:	
	1. The building shall not have a stage other than a platform.	
	2. The building shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.	
	3. The assembly floor shall be located at or within 21 inches (533 mm) of street or grade level and all exits are provided with ramps complying with Section 1010.1 to the street or grade level.	
	4. The building shall be surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.	
NYC ⇒	<b>507.7 Reserved.</b>	
NYC	<b>507.8 Group H occupancies.</b> Group H-2, H-3 and H-4 fire occupancies shall be permitted in unlimited area buildings containing Groups F and S occupancies, in accordance with Sections 507.3 and 507.4 and the limitations of this section. The aggregate floor area of the Group H occupancies located at the perimeter of the unlimited area building shall not exceed 10 percent of the area of the building, nor the area	
NYC	limitations for the Group H occupancies as specified in Table 503 as modified by Section 506.2, based upon the percentage of the perimeter of the Group H floor area that fronts on a street or other unoccupied space. The aggregate floor area of Group H occupancies not located at the perimeter of the	
	building as allowed by Section 415.3 shall not exceed 25 percent of the area limitations for the Group H occupancies as specified in Table 503. Group H occupancies shall be separated from the rest of the unlimited area buildings and from each other in accordance with Table 508.4. For two-story unlimited area buildings, the Group H occupancies shall not be located more than one story above grade plane unless permitted by the allowable height in stories and feet as set forth in Table 503 based on the type of construction of the unlimited area building.	
	<b>507.9 Aircraft paint hangar.</b> The area of a Group H-2 aircraft paint hangar no more than one story above grade plane shall not be limited where such aircraft paint hangar complies with the provisions of Section 412.6 and is surrounded and adjoined by public ways or yards not less in width than one and one-half times the building height.	
	<b>507.10 Group E buildings.</b> The area of a Group E building of Type IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1. The area of a one-story Group E building of Type IIB construction shall not be limited when the following criteria are met:	NYC NYC NYC NYC NYC NYC NYC
	1. Each classroom shall have not less than two means of egress, with one of the means of egress being a direct exit to the outside of the building complying with Section 1020.	
	2. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.	
	4. The building is surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.	NYC
	<b>507.11 Motion picture theaters.</b> In buildings of Type II, IIIA and IV construction, the area of a motion picture theater located on the first story above grade plane shall not be limited when the building is provided with an automatic sprinkler system throughout in accordance with Section 903.3.1.1 and is surrounded and adjoined on all sides by public ways or yards not less than 60 feet (18 288 mm) in width.	NYC
	<b>507.12 Covered mall buildings and anchor stores.</b> The area of covered mall buildings and anchor stores not exceeding three stories in height that comply with Section 402.6 shall not be limited.	
	<b>507.13 Group B buildings.</b> Notwithstanding the provisions of Sections 507.2 and 507.3, the area of a Group B building of Type IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1.	NYC NYC NYC NYC NYC NYC NYC NYC NYC NYC NYC
	<b>507.14 Group F-2 buildings.</b> Notwithstanding the provisions of Sections 507.2 and 507.3, the area of a Group F-2 building of Type IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1.	NYC NYC NYC NYC NYC NYC NYC NYC NYC NYC NYC
	<b>507.15 Group M buildings.</b> Notwithstanding the provisions of Sections 507.2 and 507.3, the area of a Group M building	NYC NYC NYC NYC



of Type IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1.

**507.16 Group R buildings.** The area of Group R-1 $\frac{1}{2}$  and R-2 buildings of Type IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2, as applicable.

**507.17 Group S-2 buildings.** Notwithstanding the provisions of Sections 507.2 and 507.3, the area of a Group S-2 building of Type IB, IIA, IIIA or IV construction shall not be limited where the building is protected throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1.

## SECTION BC 508 MIXED USE AND OCCUPANCY

**508.1 General.** Each portion of a building shall be individually classified in accordance with Section 302.1. Where a building contains more than one occupancy group, the building or portion thereof shall comply with the applicable provisions of Sections $\frac{1}{2}$  508.2, 508.3 or 508.4, or a combination of these sections.

### Exceptions:

1. Occupancies separated in accordance with Section 510.
2. Where required by Table 415.5.2, areas of Group H-1, H-2 and H-3 occupancies shall be located in a detached building or structure.
3. Where identified in Table 509, rooms or spaces shall be treated as incidental uses.
4. Where not identified in Table 509, mechanical and/or electrical equipment rooms shall be permitted to be classified as the occupancy within which they are located, or at the option of the applicant, classified as Group F-2 occupancy in accordance with Section 306.3.

**508.2 Accessory occupancies.** Accessory occupancies are those occupancies that are ancillary to the main occupancy of the building or portion thereof. Accessory occupancies shall comply with the provisions of Sections 508.2.1 through 508.2.4.

**508.2.1 Area limitations.** Aggregate accessory occupancies shall not occupy more than 10 percent of the building area of the story in which they are located and shall not exceed the tabular values in Table 503, without building area increases in accordance with Section 506 for such accessory occupancies.

### Exceptions:

1. The following accessory occupancies are permitted to occupy more than 10 percent of the floor area of the story in which they are located:

1.1. Accessory assembly areas having a floor area less than 750 square feet (69.7 m<sup>2</sup>).

1.2. Assembly areas that are accessory to Group E occupancies.

1.3. Accessory religious educational rooms and religious auditoriums with occupant loads of less than 100.

2. Rooms or spaces within Group H-2, H-3, H-4 or H-5 occupancy shall not be considered accessory occupancies and shall be treated as separated occupancies.

**508.2.2 Occupancy classification.** Accessory occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space.

**508.2.3 Allowable building area and height.** The allowable building area and height of the building shall be based on the allowable building area and height for the main occupancy in accordance with Section 503.1. The height of each accessory occupancy shall not exceed the tabular values in Table 503, without increases in accordance with Section 504 for such accessory occupancies. The building area of the accessory occupancies shall be in accordance with Section 508.2.1.

**508.2.4 Separation of occupancies.** No separation is required between accessory occupancies and the main occupancy.

### Exceptions:

1. Group H-2, H-3, H-4 and H-5 occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Separated tenancies in accordance with the requirements of Section 510.10.

**508.3 Nonseparated occupancies.** Buildings or portions of buildings that comply with the provisions of this section shall be considered as nonseparated occupancies.

**508.3.1 Occupancy classification $\frac{1}{2}$ .** Nonseparated occupancies shall be individually classified in accordance with Section 302.1. The requirements of this code shall apply to each portion of the building based on the occupancy classification of that space. In addition, the most restrictive provisions of Chapter 9 which apply to the nonseparated occupancies shall apply to the total nonseparated occupancy area. Where nonseparated occupancies occur in a high-rise building, the most restrictive requirements of Section 403 which apply to the nonseparated occupancies shall apply throughout the high-rise building.

**508.3.2 Allowable building area and height.** The allowable building area and height of the building or portion thereof shall be based on the most restrictive allowances for the occupancy groups under consideration for the type

**508.3.3 Separation.** No separation is required between nonseparated occupancies.

### Exceptions:

1. Group H-2, H-3, H-4 and H-5 $\frac{1}{2}$  occupancies shall be separated from all other occupancies in accordance with Section 508.4.
2. Separated tenancies in accordance with Section 510.10.
3. Kitchens shall be separated in accordance with Section 508.4.4.

**508.4 Separated occupancies.** Buildings or portions of buildings that comply with the provisions of this section shall be considered as separated occupancies.

**508.4.1 Occupancy classification.** Separated occupancies shall be individually classified in accordance with Section 302.1. Each separated space shall comply with this code based on the occupancy classification of that portion of the building.

**508.4.2 Allowable building area.** In each story, the building area shall be such that the sum of the ratios of the actual building area of each separated occupancy divided by the allowable building area of each separated occupancy shall not exceed 1.

**508.4.3 Allowable height.** Each separated occupancy shall comply with the building height limitations based on the type of construction of the building in accordance with Section 503.1.

**Exception:** Special provisions permitted by Section 510 shall permit occupancies at building heights other than provided in Section 503.1.

**508.4.4 Separation.** Individual occupancies shall be separated from adjacent occupancies in accordance with Table 508.4.

**Exceptions:**

1. Fire separations of Group H and I-2 occupancies shall not be permitted any reductions in fire-resistance ratings.
2. Nonresidential kitchens need not be separated by fire separations from adjoining dining spaces, provided that all of the following conditions are satisfied:
  - 2.1. The cooking equipment is vented directly to the outdoors; and
  - 2.2. A draft curtain of noncombustible material, at least 24 inches (609 mm) down from the ceiling, is provided to separate the cooking facilities from dining spaces; and
  - 2.3. Fire protection systems in accordance with the provisions of Section 903 and 904 are provided on the cooking facilities side of the curtain, or any opening between the kitchen and dining space, located within 24 inches (609 mm) of the curtain or opening, and spaced not more than 48 inches (1219 mm) on center if the opening is more than 60 inches (1524 mm) wide.

**TABLE 508.4  
REQUIRED SEPARATION OF OCCUPANCIES (HOURS)**

NYC	OCCUPANCY	A, E		I-1, I-3, I-4		I-2		R <sup>a</sup>		F-2, S-2 <sup>b</sup> , U		B		F-1		M		S-1		H-1		H-2		H-3, H-4		H-5	
		S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS	S	NS
NYC	A, E	N	N	1	2	2	NP	1	2	N	1	1	2	1	2	1	2	1	2	NP	NP	3	4	2	3	2	NP
NYC	I-1, I-3, I-4	--	--	N	N	2	NP	1	NP	1	2	1	2	1	2	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
	I-2	--	--	--	--	N	N	2	NP	2	NP	2	NP	2	NP	2	NP	2	NP	NP	NP	3	NP	2	NP	2	NP
NYC	R <sup>a</sup>	--	--	--	--	--	--	N	N	1 <sup>c</sup>	2 <sup>c</sup>	1	2	1	2	1	2	1	2	NP	NP	3	NP	2	NP	2	NP
NYC	F-2, S-2 <sup>b</sup> , U	--	--	--	--	--	--	--	--	N	N	1	2	1	2	1	2	1	2	NP	NP	3	4	2	3	2	NP
NYC	B	--	--	--	--	--	--	--	--	--	--	N	N	2	3	1	2	2	3	NP	NP	2	3	1	2	1	NP
NYC	F-1	--	--	--	--	--	--	--	--	--	--	--	--	N	N	2	3	2	3	NP	NP	2	3	1	2	1	NP
NYC	M	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	N	2	3	NP	NP	2	3	1	2	1	NP
NYC	S-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	N	NP	NP	2	3	1	2	1	NP
	H-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	NP	NP	NP	NP	NP	NP	NP
	H-2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	NP	1	NP	1	NP
NYC	H-3, H-4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1 <sup>d</sup>	NP	1	NP
NYC	H-5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	N	NP

S = Buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

NS = Buildings not equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.

N = No separation requirement.

NP = Not permitted.

NYC a. See Section 420.

→ b. The required separation from areas used only for private or pleasure vehicles shall be reduced by 1 hour but to not less than 1 hour.

→ c. See Section 406.1.4.

→ d. Separation is not required between occupancies of the same classification.

**508.4.4.1 Construction.** Required separations shall be fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both, so as to completely separate adjacent occupancies.

## SECTION 509 INCIDENTAL USES

**509.1 General.** Incidental uses listed in Table 509 and located within single occupancy or mixed occupancy buildings shall comply with the provisions of this section. Incidental uses are ancillary functions associated with a given occupancy that generally pose a greater level of risk to that occupancy and are limited to those uses listed in Table 509.

**Exception:** Incidental uses within and serving a dwelling unit are not required to comply with this section.

**509.2 Occupancy classification.** Incidental uses shall not be individually classified in accordance with Section 302.1. Incidental uses shall be included in the building occupancies within which they are located.

**509.3 Area limitations.** Incidental uses shall not occupy more than 10 percent of the building in which they are located.

**509.4 Separation and protection.** The incidental uses listed in Table 509 shall be separated from the remainder of the

building or equipped with an automatic sprinkler system, or both, in accordance with the provisions of that table.

**509.4.1 Separation.** Where Table 509 specifies a fire-resistance-rated separation, the incidental uses shall be separated from the remainder of the building by a fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 712, or both. Construction supporting 1-hour fire barriers or horizontal assemblies used for incidental use separations in buildings of Type IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code.

**509.4.2 Protection.** Where Table 509 permits an automatic sprinkler system without a fire barrier, the incidental uses shall be separated from the remainder of the building by construction capable of resisting the passage of smoke. The walls shall extend from the top of the foundation or floor assembly below to the underside of the ceiling that is a component of a fire-resistance-rated floor assembly or roof assembly above or to the underside of the floor or roof sheathing, deck or slab above. Doors shall be self- or automatic-closing upon detection of smoke in accordance with Section 715.4.8.3. Doors shall not have air transfer openings and shall not be undercut in excess of the clearance permitted in accordance with NFPA 80. Walls surrounding the incidental use shall not have air transfer openings unless provided with smoke dampers in accordance with Section 710.7.

TABLE 509<sup>c</sup>  
INCIDENTAL USES

ROOM OR AREA	SEPARATION AND/OR PROTECTION
Furnace room where any piece of equipment is over 350,000 Btu per hour input	2 hour; or 1 hour and provide automatic sprinkler system <sup>a</sup>
Furnace room where any piece of equipment is 350,000 Btu per hour input or less, except in R-3 occupancy	1 hour or provide automatic sprinkler system <sup>a</sup>
Rooms with a high pressure steam or water boiler that exceeds 350,000 Btu per hour input	2 hour; or 1 hour and provide automatic fire-extinguishing system <sup>a</sup>
Rooms with a high pressure steam or water boiler that is 350,000 Btu per hour input or less	1 hour or provide automatic sprinkler system <sup>a</sup>
Rooms that contain a low pressure steam or water boiler regardless of Btu per hour input	1 hour or provide automatic sprinkler system <sup>a, b</sup>
Refrigerant machinery room	1 hour or provide automatic sprinkler system
Incinerator rooms	2 hours and automatic sprinkler system
Paint shops, not classified a Group H, located in occupancies other than Group F	2 hours; or 1 hour and provide automatic sprinkler system
Laboratories and vocational shops, not classified as Group H, located in a Group E or I-2 occupancy	1 hour or provide automatic sprinkler system
Laundry rooms over 100 square feet	1 hour or provide automatic sprinkler system
Group I-3 cells equipped with padded surfaces	1 hour
Waste and linen collection rooms located in either Group I-2 occupancies or ambulatory care facilities	1 hour
Waste and linen collection rooms over 100 square feet	1 hour or provide automatic sprinkler system
Stationary storage battery systems having a liquid electrolyte capacity of more than 50 gallons for flooded lead-acid, nickel cadmium or VRLA, or more than 1,000 pounds for lithium-ion and lithium metal polymer used for facility standby power, emergency power or uninterruptable power supplies	1 hour in group B, F, M, S and U occupancies; 2 hours in Group A, E, I and R occupancies
Rooms containing fire pumps in non-high-rise buildings	2 hours; or 1 hour and provide automatic sprinkler system throughout the building
Rooms containing fire pumps in high-rise buildings	2 hours

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 pound per square inch (psi) = 6.9 kPa, 1 British thermal unit (Btu) per hour = 0.293 watts, 1 horsepower = 746 watts, 1 gallon = 3.785 L.

a. Boilers servicing more than one dwelling unit in multiple<sup>‡</sup> dwellings shall also comply with Section 65 of the *New York State Multiple Dwelling Law*.

b. Sealed combustion direct vent boilers shall comply with Section 303 of the *New York City Mechanical Code* and Section 303 of the *New York City Fuel Gas Code*, as applicable.

c. For mechanical and/or electrical equipment rooms not identified in this Table, see Section 508.1.

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**509.4.2.1 Protection limitation.** Except as specified in Table 509 for certain incidental uses, where an automatic sprinkler system is provided in accordance with Table 509, only the space occupied by the incidental use need be equipped with such a system.

## SECTION BC 510 SPECIAL PROVISIONS

**‡510.1 General.** The provisions in this section shall permit the use of special conditions that are exempt from, or modify, the specific requirements of this chapter regarding the allowable heights and areas of buildings based on the occupancy classification and type of construction, provided the special condition complies with the provisions specified in this section for such condition and other applicable requirements of this code. The provisions of Sections 510.2 through 510.8 are to be considered independent and separate from each other.

**510.2 Horizontal building separation allowance.** Buildings shall be considered as separate and distinct from each other for the purpose of determining area limitations, continuity of fire walls, limitation of number of stories and type of construction, where all of the following conditions are met:

1. The buildings are separated with a horizontal floor assembly having a minimum 3-hour fire-resistance rating.
2. The building below the horizontal assembly is no more than one story above grade plane.
3. The building below the horizontal assembly is of Type IA construction.
4. Shaft, stairway, ramp or escalator enclosures through the horizontal floor assembly shall have a minimum of 2-hour fire-resistance rating with opening protectives in accordance with Section 715.4.

**Exception:** Where the enclosure walls below the horizontal floor assembly have a minimum of 3-



hour fire-resistance rating with opening protectives in accordance with Section 715.4, the enclosure walls extending above the horizontal floor assembly shall be permitted to have a 1-hour fire-resistance rating provided:

- 4.1. The building above the horizontal floor assembly is not required to be of Type I construction;
- 4.2. The enclosure connects less than four stories; and
- 4.3. The enclosure opening protectives above the horizontal floor assembly have a minimum 1-hour fire protection rating.

5. The building or buildings above the horizontal assembly shall be permitted to have multiple Group A occupancy uses, each with an occupant load of less than 300, or Group B, M, R, or S occupancies.‡

6. The building below the horizontal assembly shall be protected throughout by an approved automatic sprinkler system in accordance with Section 903.3.1.1, and shall be permitted to be any of the following occupancies:

- 6.1. Group S-2 parking garage used for the parking and storage of private motor vehicles.
- 6.2. Uses incidental to the operation of the building (including entry lobbies, mechanical rooms, storage areas and similar uses).

7. The maximum building height in feet (mm) as measured from the grade plane shall not exceed the limits set forth in Section 503 for the building having the smaller allowable height as measured from the grade plane.

**510.3 Group S-2 enclosed parking garage with Group S-2 open parking garage above.** A Group S-2 enclosed parking garage with no more than one story above grade plane and located below a Group S-2 open parking garage shall be classified as a separate and distinct building for the purpose of determining the type of construction where all of the following conditions are met:

1. The allowable area of the building shall be such that the sum of the ratios of the actual area divided by the allowable area for each separate occupancy shall not exceed 1.
2. The Group S-2 enclosed parking garage is of Type I or II construction and is at least equal to the fire-resistance requirements of the Group S-2 open parking garage.
3. The height and the number of the tiers of the Group S-2 open parking garage shall be limited as specified in Table 406.3.5.
4. The floor assembly separating the Group S-2 enclosed parking garage and Group S-2 open parking garage shall be protected as required for the floor assembly of the Group S-2 enclosed parking garage. Openings between the Group S-2 enclosed parking garage and Group S-2 open parking garage, except exit openings, shall not be required to be protected.

5. The Group S-2 enclosed parking garage is used exclusively for the parking or storage of private motor vehicles, but shall be permitted to contain an accessory office, waiting room and toilet room having a total area of not more than 1,000 square feet (93 m<sup>2</sup>), and mechanical equipment rooms incidental to the operation of the building.

**510.4 Parking beneath Group R.** Where a maximum one-story above grade plane Group S-2 parking garage, enclosed or open, or combination thereof, of Type I construction or open of Type IV construction, with grade entrance, is provided under a building of Group R, the number of stories to be used in determining the minimum type of construction shall be measured from the floor above such a parking area. The horizontal floor assembly between the parking garage and the Group R above shall comply with the type of construction required for the parking garage and shall also provide a fire-resistance rating not less than the mixed occupancy separation required in Section 508.4.

#### 510.5 Reserved.

**510.6 Group R-2 buildings of Type IIA construction.** The height limitation for buildings of Type IIA construction in Group R-2 shall be increased to nine stories and 100 feet (30 480 mm) where the building is separated by not less than 50 feet (15 240 mm) from any other building on the lot and from lot lines, the exits are segregated in an area enclosed by a 2-hour fire-resistance-rated fire wall and the first-floor assembly has a fire-resistance rating of not less than 1½ hours.

**510.7 Open parking garage beneath Groups A, I, B, M and R.** Open parking garages constructed under Groups A, I, B, M and R shall not exceed the height and area limitations permitted under Section 406.3. The height and area of the portion of the building above the open parking garage shall not exceed the limitations in Section 503 for the upper occupancy. The height, in both feet and stories, of the portion of the building above the open parking garage shall be measured from grade plane and shall include both the open parking garage and the portion of the building above the parking garage.

**510.7.1 Fire separation.** Fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712 between the parking occupancy and the upper occupancy shall correspond to the required fire-resistance rating prescribed in Table 508.4 for the occupancies involved. The type of construction shall apply to each occupancy individually, except that structural members, including main bracing within the open parking structure, which is necessary to support the upper occupancy, shall be protected with the more restrictive fire-resistance-rated assemblies of the groups involved as shown in Table 601. Means of egress for the upper occupancy shall conform to Chapter 10 and shall be separated from the parking occupancy by fire barriers having at least a 2-hour fire-resistance rating as required by Section 707, with self-closing doors complying with Section 715 or horizontal assemblies having at least a 2-hour fire-resistance rating as required by Section 712, with self-closing doors complying with Section 715. Means of

egress from the open parking garage shall comply with Section 406.3.

**NYC 510.8 Industrial uses in buildings containing Group R.** No space classified as Factory Industrial Group F shall be located above the second story of any building of Type III, IV or V construction containing a space classified as Residential Group R-1 or R-2.

**NYC 510.9 Multiple buildings above Group S-2 parking garages.** Where two or more buildings are provided above the horizontal assembly separating a Group S-2 open or closed parking garage from the buildings above in accordance with the special provisions in Section 510.2, 510.3 or 510.8, the buildings above the horizontal assembly shall be regarded as separate and distinct buildings from each other and shall comply with all other provisions of this code as applicable to each separate and distinct building.

**NYC 510.10 Separation of different tenancies.** Spaces or dwelling units occupied by different tenants shall be separated by fire barriers having at least 1-hour fire-resistance ratings.

**Exceptions:**

1. Nonresidential spaces occupied by different tenants located in buildings that are sprinklered throughout.
2. Tenant spaces in covered mall buildings complying with Section 402.



## CHAPTER 6

# TYPES OF CONSTRUCTION

### SECTION BC 601 GENERAL

**601.1 Scope.** The provisions of this chapter shall control the classification of buildings as to type of construction.

### SECTION BC 602 CONSTRUCTION CLASSIFICATION

**602.1 General.** Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 602.2 through 602.5. The building elements shall have a fire-

resistance rating not less than that specified in Table 601 and exterior walls shall have a fire-resistance rating not less than that specified in Table 602. Where required to have a fire-resistance rating by Table 601, building elements shall comply with the applicable provisions of Section 703.2. The protection of openings, ducts and air transfer openings in building elements shall not be required unless required by other provisions of this code. Buildings constructed or altered inside the fire district shall further comply with Appendix D.

**602.1.1 Minimum requirements.** A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type, which meets

**TABLE 601**  
**FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)**

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V <sup>j</sup>	
	A	B	A <sup>d</sup>	B	A <sup>d</sup>	B	HT	A <sup>d</sup>	B
Primary structural frame <sup>g, k</sup> (see Section 202)	3 <sup>a</sup>	2 <sup>a</sup>	1	0	1	0	HT	1	0
Bearing walls									
Exterior <sup>f, g, h</sup>	3	2	1	0	2	2	2	1	0
Interior	3 <sup>a</sup>	2 <sup>a</sup>	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions	See Table 602								
Exterior									
Nonbearing walls and partitions									
Interior <sup>e</sup>	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction <sup>i</sup> ‡ and secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and secondary members (see Section 202) ‡	1 1/2 <sup>b, c</sup>	1 <sup>b, c</sup>	1 <sup>b, c</sup>	0 <sup>b, c</sup> ‡	1 <sup>b, c</sup>	0	HT	1 <sup>b, c</sup>	0

For SI: 1 foot = 304.8 mm.

- a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
- b. 1. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
2. Except in Group F occupancies subject to regulation under Sections 264(1) and 264(2) of the *New York State Labor Law*, and in Group I-1, R-1, and R-2 occupancies, in Types I and II construction, fire-retardant-treated wood shall be allowed in buildings including girders and trusses as part of the roof construction when the building is:
  - i. Type II construction of any height; or
  - ii. Type I construction two stories or less; or when over two stories, the vertical distance from the upper floor to the roof is 20 feet or more.
- c. Except in Group F occupancies subject to regulation under Sections 264(1) and 264(2) of the *New York State Labor Law*, and in Group I-1, R-1 and R-2 occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.
- d. An approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.
- e. Not less than the fire-resistance rating required by other sections of this code.
- f. Not less than the fire-resistance rating based on fire separation distance (see Table 602).
- g. Not less than the fire-resistance rating as referenced in Section 704.10.
- h. See Note ‡ g ‡ of Table 602.
- i. See Section 712.3 ‡ for additional requirements.
- j. Type V construction is not permitted inside fire districts except as provided for in Section D105.1 of Appendix D.
- k. See Section BC 403.2.1 for additional requirements for high-rise buildings.



## TYPES OF CONSTRUCTION

the minimum requirements based on occupancy even though certain features of such a building actually conform to a higher type of construction. Classification shall be that of the minimum requirement unless all of the requirements for the higher type of construction are met.

**Exception:** Portions of buildings that cantilever over an adjacent building or tax lot shall also comply with the fire-resistance ratings of Section 705.12.

**602.2 Types I and II.** Types I and II construction are those types of construction in which the building elements listed in Table 601 are of noncombustible materials, except as permitted in Section 603 and elsewhere in this code.

**602.3 Type III.** Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. Fire-retardant-treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hour rating or less.

### Exceptions:

1. In Group I-1, R-1, and R-2 occupancies, all exterior walls, fire walls, exit passageways, and shaft enclosures shall be noncombustible.
2. In Group F occupancies subject to Section 270(1) of the *New York State Labor Law*, all exterior wall

assemblies and all structural elements shall meet the requirements for a "fireproof building" as such term is defined in Section 264 of such law.

3. Inside the fire district, exterior load-bearing walls shall be constructed of noncombustible material.
4. Inside the fire district, exterior nonload-bearing walls may be constructed with fire-retardant-treated wood complying with Section 2303.2 where the building is equipped throughout with an automatic sprinkler system in accordance with Sections 903.3.1.1 through 903.3.1.3, unless otherwise prohibited by Exception 1 or 2 above.

**602.4 Type IV.** Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. The details of Type IV construction shall comply with the provisions of this section. Fire-retardant-treated-wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less. Minimum solid sawn nominal dimensions are required for structures built using Type IV construction (HT). For glued-laminated members the equivalent net finished width and depths corresponding to the minimum nominal width and

TABLE 602

FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE<sup>a, e, g, h</sup>

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H <sup>f</sup>	OCCUPANCY GROUP F-1, M, S-1 <sup>g</sup>	OCCUPANCY GROUP A, B, E, F-2, I, R, S-2, U <sup>b</sup>
X < 5 <sup>c</sup>	All	3	2	1
5 ≤ X < 10	IA	3	2	1
	Others	2	1	1
10 ≤ X < 30	IA, IB	2	1	1 <sup>d</sup>
	IIB, VB	1	0	0
	Others	1	1	1 <sup>d</sup>
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

- a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
- b. Group U when used as accessory to Group R-3 shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet or more for free standing private garages in compliance with Section 406.1, and when the separation distance is 3 feet or more for other freestanding Group U buildings. For free standing private garages where the fire separation distance is less than 5 feet, refer to Section 406.1 for required fire-resistance rating for exterior walls.
- c. See Section 706.1.1 for party walls.
- d. Open parking garages complying with Section 406 shall not be required to have a fire resistance rating.
- e. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
- f. For special requirements for Group H occupancies, see Section 415.3.
- g. Inside the fire district, exterior load-bearing walls of Type II buildings shall have a fire-resistance rating not less than prescribed below:
 

X < 5	2 hours
5 ≤ X < 10	2 hours
10 ≤ X < 30	1 hour
X ≥ 30	As per table 602.
- h. Inside the fire district, exterior nonload-bearing walls of Type II buildings shall have a fire-resistance rating not less than prescribed below:
 

X < 5	As per Table 602
5 ≤ X < 10	As per Table 602
10 ≤ X < 30	1 hour
X ≥ 30	As per Table 602.

depths of solid sawn lumber are required as specified in Table 602.4.

#### Exceptions:

1. In Group I-1, R-1, and R-2 occupancies, all exterior walls, fire walls, exit passageways, and shaft enclosures shall be noncombustible.
2. In Group F occupancies subject to Section 270(1) of the *New York State Labor Law*, all exterior wall assemblies and all structural elements shall meet the requirements for a "fireproof building" as defined in Section 264 of such law.
3. Inside the fire district, exterior load-bearing walls shall be constructed of noncombustible material.
4. Inside the fire district, exterior non-bearing walls may be constructed with fire-retardant-treated wood complying with Section 2303.2 where the building is equipped throughout with an automatic sprinkler system in accordance with Sections 903.3.1.1 through 903.3.1.3, unless otherwise prohibited by Exception 1 or 2 above.

**TABLE 602.4  
WOOD MEMBER SIZE**

MINIMUM NOMINAL SOLID SAWN		MINIMUM GLUED-LAMINATED NET	
Width, inch	Depth, inch	Width, inch	Depth, inch
8	8	6 <sup>3</sup> / <sub>4</sub>	8 <sup>1</sup> / <sub>4</sub>
6	10	5	10 <sup>1</sup> / <sub>2</sub>
6	8	5	8 <sup>1</sup> / <sub>4</sub>
6	6	5	6
4	6	3	6 <sup>7</sup> / <sub>8</sub>

For SI: 1 inch = 25.4 mm.

**602.4.1 Columns.** Wood columns shall be sawn or glued laminated and shall not be less than 8 inches (203 mm) nominal in any dimension where supporting floor loads and not less than 6 inches (152 mm) nominal in width and not less than 8 inches (203 mm) nominal in depth where supporting roof and ceiling loads only. Columns shall be continuous or superimposed and connected in an approved manner.

**602.4.2 Floor framing.** Wood beams and girders shall be of sawn or glued-laminated timber and shall be not less than 6 inches (152 mm) nominal in width and not less than 10 inches (254 mm) nominal in depth. Framed sawn or glued-laminated timber arches, which spring from the floor line and support floor loads, shall be not less than 8 inches (203 mm) nominal in any dimension. Framed timber trusses supporting floor loads shall have members of not less than 8 inches (203 mm) nominal in any dimension.

**602.4.3 Roof framing.** Wood-frame or glued-laminated arches for roof construction, which spring from the floor

line or from grade and do not support floor loads, shall have members not less than 6 inches (152 mm) nominal in width and have less than 8 inches (203 mm) nominal in depth for the lower half of the height and not less than 6 inches (152 mm) nominal in depth for the upper half. Framed or glued laminated arches for roof construction that spring from the top of walls or wall abutments, framed timber trusses and other roof framing, which do not support floor loads, shall have members not less than 4 inches (102 mm) nominal in width and not less than 6 inches (152 mm) nominal in depth. Spaced members shall be permitted to be composed of two or more pieces not less than 3 inches (76 mm) nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 2 inches (51 mm) nominal in thickness secured to the underside of the members. Splice plates shall be not less than 3 inches (76 mm) nominal in thickness. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches (76 mm) nominal in width.

**602.4.4 Floors.** Floors shall be without concealed spaces. Wood floors shall be of sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76 mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, or 0.5-inch (12.7 mm) particle-board or planks not less than 4 inches (102 mm) nominal in width set on edge close together and well spiked and covered with 1-inch (25 mm) nominal dimension flooring or <sup>15</sup>/<sub>32</sub>-inch (12 mm) wood structural panel or 0.5-inch (12.7 mm) particleboard. The lumber shall be laid so that no continuous line of joints will occur except at points of support. Floors shall not extend closer than 0.5 inch (12.7 mm) to walls. Such 0.5-inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbeling of masonry walls under the floor shall be permitted to be used in place of molding.

**602.4.5 Roofs.** Roofs shall be without concealed spaces and wood roof decks shall be sawn or glued laminated, splined or tongue-and-groove plank, not less than 2 inches (51 mm) nominal in thickness, 1 <sup>1</sup>/<sub>8</sub>-inch-thick (32 mm) wood structural panel (exterior glue), or of planks not less than 3 inches (76 mm) nominal in width, set on edge close together and laid as required for floors. Other types of decking shall be permitted to be used if providing equivalent fire resistance and structural properties.

**602.4.6 Partitions.** Partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, or of 1-hour fire-resistance-rated construction.

**602.4.7 Exterior structural members.** Where a horizontal separation of 20 feet (6096 mm) or more is provided,

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**Exception:** In Group F occupancies subject to Section 270(1) of the *New York State Labor Law*, all exterior wall assemblies and all structural elements shall meet the requirements for a “fireproof building” as defined in Section 264 of such law.

**603.1 Allowable materials.** Combustible materials shall be permitted in buildings of Type I or II construction in the following applications and in accordance with Sections 603.1.1 through 603.1.3.

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1. Fire-retardant-treated wood, complying with Section 2303.2, shall be permitted in:
    - 1.1. Nonbearing interior partitions where the required fire-resistance rating is 1 hour or less.

**Exception:** Public corridors and exits shall be constructed of noncombustible materials.
    - 1.2. Roof construction as permitted in Table 601, Note b.
  2. Thermal and acoustical insulation, other than foam plastics, having a flame spread index of not more than 25.

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**NYC** **603.1.1 Ducts.** The use of nonmetallic ducts shall be permitted when installed in accordance with the limitations of the *New York City Mechanical Code*.

**NYC** **603.1.2 Piping.** The use of combustible piping materials shall be permitted when installed in accordance with the limitations of the *New York City Mechanical Code* and the *New York City Plumbing Code*.

**NYC** **603.1.3 Electrical.** The use of electrical wiring methods with combustible insulation, tubing, raceways and related components shall be permitted when installed in accordance with the limitations of the *New York City Electrical Code*.





## CHAPTER 7

# FIRE AND SMOKE PROTECTION FEATURES

### SECTION BC 701 GENERAL

**701.1 Scope.** The provisions of this chapter shall govern the materials and assemblies used for structural fire resistance and fire-resistance-rated construction separation of adjacent spaces to safeguard against the spread of fire and smoke within a building and the spread of fire to or from buildings.

### SECTION BC 702 DEFINITIONS

**702.1 Definitions.** The following words and terms shall, for the purposes of this chapter, and as used elsewhere in this code, have the meanings shown herein.

**ANNULAR SPACE.** The opening around the penetrating item.

**BUILDING ELEMENT.** A fundamental component of building construction, listed in Table 601, which may or may not be of fire-resistance-rated construction and is constructed of materials based on the building type of construction.

**CEILING RADIATION DAMPER.** A listed device installed in a ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly to limit automatically the radiative heat transfer through an air inlet/outlet opening.

**COMBINATION FIRE/SMOKE DAMPER.** A listed device installed in ducts and air transfer openings designed to close automatically upon the detection of heat and resist the passage of flame and smoke. The device is installed to operate automatically, controlled by a smoke detection system, and where required, is capable of being positioned from a fire command center.

**CONCEALED SPACES.** Enclosed spaces within partitions, walls, floors, roofs, stairs, furring, pipe chases and column enclosures and other similar spaces.

**DAMPER.** See “Ceiling radiation damper,” “Combination fire/smoke damper,” “Fire damper” and “Smoke damper.”

**DRAFT STOP.** A material, device or construction installed to restrict the movement of air within open spaces of concealed areas of building components such as crawl spaces, floor/ceiling assemblies, roof/ceiling assemblies and attics.

**F RATING.** The time period that the through-penetration firestop system limits the spread of fire through the penetration when tested in accordance with ASTM E 814.

**FIRE BARRIER.** A fire-resistance-rated wall assembly of materials complying with Section 707 designed to restrict the spread of fire in which continuity of the fire-resistance rating is maintained.

**FIRE DAMPER.** A listed device, installed in ducts and air transfer openings designed to close automatically upon detection of heat and restrict the passage of flame. Fire

dampers are classified for use in either static systems that will automatically shut down in the event of a fire, or in dynamic systems that continues to operate during a fire. A dynamic fire damper is tested and rated for closure under elevated temperature airflow.

**FIRE DOOR.** The door component of a fire door assembly.

**FIRE DOOR ASSEMBLY.** Any combination of a fire door, frame, hardware, and other accessories that together, as an opening protective, provide a specific degree of fire protection to the opening.

**FIRE PARTITION.** A vertical assembly of materials complying with Section 709, designed to restrict the spread of fire in which openings are protected.

**FIRE PROTECTION RATING.** The period of time that an opening protective assembly will maintain the ability to confine a fire as determined by tests prescribed in Section 715. Ratings are stated in hours or minutes.

**FIRE RESISTANCE.** That property of materials or their assemblies that prevents or retards the passage of excessive heat, hot gases or flames under conditions of use.

**FIRE-RESISTANCE RATING.** The period of time a building element, component or assembly maintains the ability to withstand fire exposure, continues to perform a given structural function, or both, as determined by the tests, or the methods based on tests, prescribed in Section 703.

**FIRE-RESISTANT JOINT SYSTEM.** An assemblage of specific materials or products that are designed, tested, and fire-resistance rated in accordance with either ASTM E 1966 or UL 2079 to resist for a prescribed period of time the passage of fire through joints made in or between fire-resistance-rated assemblies.

**FIRE SEPARATION DISTANCE.** The distance measured from the building face to one of the following:

1. The closest interior tax lot line;
2. To the centerline of a street, an alley or public space; or
3. To an imaginary line between two buildings on the same tax lot.

The distance shall be measured at right angles from the face of the wall.

**FIRE WALL.** A fire-resistance-rated smoke-tight wall having protected openings, which restricts the spread of fire and extends continuously from the foundation to or through the roof, with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

**FIRE WINDOW ASSEMBLY.** A window, as an opening protective, constructed and glazed to give protection against the passage of fire, smoke and hot gases.

**FIREBLOCKING.** A building material or materials approved for use as fireblocking to resist the free passage of flame or hot gases to other areas of the building through concealed spaces.

**FIRESTOPPING.** A through-penetration firestop or a membrane penetration firestop.

**FLOOR FIRE DOOR ASSEMBLY.** A combination of a fire door, a frame, hardware and other accessories installed, as an opening protective, in a horizontal plane, which together provide a specific degree of fire protection to a through opening in a fire-resistance-rated floor (see Section 712.8).

**HORIZONTAL ASSEMBLY.** A fire-resistance-rated floor or roof assembly of materials designed to restrict the spread of fire in which continuity of the fire-resistance rating is maintained.

**MEMBRANE PENETRATION.** An opening made through one side (wall, floor or ceiling membrane) of an assembly.

**MEMBRANE PENETRATION FIRESTOP.** A material, device, or assemblage of specific materials or products that is designed, tested and fire-resistance rated to resist for a prescribed time period the passage of flame and heat through openings in a protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.

**MINERAL FIBER.** Insulation composed principally of fibers manufactured from rock, slag or glass, with or without binders.

**MINERAL WOOL.** Synthetic vitreous fiber insulation made by melting predominantly igneous rock or furnace slag, and other inorganic materials, and then physically forming the melt into fibers.

**PENETRATION FIRESTOP.** A through-penetration firestop or a membrane penetration firestop.

**SELF-CLOSING.** As applied to a fire door or other opening, means equipped with an approved device that will ensure closing after having been opened.

**SHAFT.** An enclosed space extending through one or more stories of a building, connecting vertical openings in successive floors, or floors and roof.

**SHAFT ENCLOSURE.** The walls or construction forming the boundaries of a shaft.

**SMOKE BARRIER.** A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly, that is designed and constructed in accordance with Section 710 to restrict the movement of smoke.

**SMOKE COMPARTMENT.** A space within a building enclosed by smoke barriers on all sides, including the top and bottom.

**SMOKE DAMPER.** A listed device installed in ducts and air transfer openings that is designed to resist the passage of air and smoke. The device is installed to operate automatically, controlled by a smoke detection system, and where required, is capable of being positioned from a fire command center.

**SMOKE PARTITION.** A continuous vertical assembly that is designed and constructed to restrict the movement of smoke and is not generally required to have a fire-resistance rating in accordance with Section 711.

**T RATING.** The time period that the penetration firestop system, including the penetrating item, limits the maximum temperature rise to 325°F (163°C) above its initial temperature through the penetration on the nonfire side when tested in accordance with ASTM E 814.

**THROUGH PENETRATION.** An opening that passes through an entire assembly.

**THROUGH-PENETRATION FIRESTOP SYSTEM.** An assemblage of specific materials or products that are designed, tested and fire-resistance rated to resist for a prescribed period of time the spread of fire through penetrations. The F and T rating criteria for penetration firestop systems shall be in accordance with ASTM E 814 or UL 1479. See definitions of "F rating" and "T rating."

## SECTION BC 703 FIRE-RESISTANCE RATINGS AND FIRE TESTS

**703.1 Scope.** Materials prescribed herein for fire resistance shall conform to the requirements of this chapter.

**703.2 Fire-resistance ratings.** The fire-resistance rating of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the commissioner to show that the required fire-resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire-resistance-rated building elements, components or assemblies shall not reduce the required fire-resistance rating.

**Exception:** In determining the fire-resistance rating of exterior bearing walls, compliance with the ASTM E 119 or UL 263 criteria for unexposed surface temperature rise and ignition of cotton waste due to passage of flame or gases is required only for a period of time corresponding to the required fire-resistance rating of an exterior non-bearing wall with the same fire separation distance, and in a building of the same group. When the fire-resistance rating determined in accordance with this exception exceeds the fire-resistance rating determined in accordance with ASTM E 119 or UL 263, the fire exposure time period, water pressure, and application duration criteria for the hose stream test of ASTM E 119 or UL 263 shall be based upon the fire-resistance rating determined in accordance with this exception.

**703.2.1 Nonsymmetrical wall construction.** Interior walls and partitions of nonsymmetrical construction shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests conducted in compliance with ASTM E 119 or UL 263. When evidence is fur-

nished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the commissioner, the wall need not be subjected to tests from the opposite side (see Section 705.5 for exterior walls).

**703.2.2 Combustible components.** Combustible aggregates may be integrated with other materials to form a noncombustible material provided that the entire mixture, in the form in which it is to be used in construction, meets the requirement of this code for noncombustible construction.

**703.2.3 Restrained classification.** Fire-resistance-rated assemblies tested under ASTM E 119 or UL 263 shall not be considered to be restrained unless evidence satisfactory to the commissioner is furnished by the registered design professional showing that the construction qualifies for a restrained classification in accordance with ASTM E 119 or UL 263. Restrained construction shall be identified on the plans.

**703.3 Alternative methods for determining fire resistance.** The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in ASTM E 119 or UL 263. The required fire resistance of a building element, component or assembly shall be permitted to be established by any of the following methods or procedures:

1. Fire-resistance designs documented in approved sources.
2. Prescriptive designs of fire-resistance-rated building elements, components or assemblies as prescribed in Section 720.
3. Calculations in accordance with Section 721.
4. Engineering analysis based on a comparison of building element, component or assemblies designs having fire-resistance ratings as determined by the test procedures set forth in ASTM E 119 or UL 263.
5. Alternative protection methods as allowed by rules of the department.

**703.4 Noncombustibility tests.** The tests indicated in Sections 703.4.1 and 703.4.2 shall serve as criteria for acceptance of building materials as set forth in Sections 602.2, 602.3 and 602.4 in Type I, II, III and IV construction. The term "noncombustible" does not apply to the flame spread characteristics of interior finish or trim materials. A material shall not be classified as a noncombustible building construction material if it is subject to an increase in combustibility or flame spread beyond the limitations herein established through the effects of age, fabrication or erection techniques, moisture or other atmospheric conditions.

**703.4.1 Elementary materials.** Materials required to be noncombustible shall be tested in accordance with ASTM E 136.

**703.4.2 Composite materials.** Materials having a structural base of noncombustible material as determined in accordance with Section 703.4.1 with a surfacing not more than 0.125 inch (3.18 mm) thick that has a flame

spread index not greater than 50 when tested in accordance with ASTM E 84 or UL 723 shall be acceptable as noncombustible materials.

**703.5 Fire-resistance-rated glazing.** Fire-resistance-rated glazing, when tested in accordance with ASTM E 119 or UL 263 and complying with the requirements of Section 707, shall be permitted. Fire-resistance-rated glazing shall bear a label or other identification showing the name of the manufacturer, the test standard and the identifier "W-XXX," where the "XXX" is the fire-resistance rating in minutes. Such label or identification shall be issued by an approved agency and shall be permanently affixed to the glazing.

**703.6 Marking and identification.** Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall be located in accessible concealed floor, floor-ceiling or attic spaces; and

1. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition; and
2. Include lettering not less than 0.5 inch (12.7 mm) in height, incorporating the suggested wording:

"FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS."

**Exception:** Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

## SECTION 704 FIRE-RESISTANCE RATING OF STRUCTURAL MEMBERS

**704.1 Requirements.** The fire-resistance ratings of structural members and assemblies shall comply with this section and the requirements for the type of construction as specified in Table 601. The fire-resistance ratings shall not be less than the ratings required for the fire-resistance-rated assemblies supported by the structural members.

**Exception:** Fire barriers, fire partitions, smoke barriers and horizontal assemblies as provided in Sections 707.5, 709.4, 710.4 and 712.4, respectively.

**704.2 Column protection.** Where columns are required to be fire-resistance rated, the entire column shall be provided individual encasement protection by protecting it on all sides for the full column length, including connections to other structural members, with materials having the required fire-resistance rating. Where the column extends through a ceiling, the encasement protection shall be continuous from the top of the foundation or floor/ceiling assembly below through the ceiling space to the top of the column.

**704.3 Protection of the primary structural frame other than columns.** Members of the primary structural frame other than columns that are required to have a fire-resistance rating and support more than one floor or one floor and roof, or support a load-bearing wall or a nonload-bearing wall



NYC more than one story high, shall be provided individual encasement protection by protecting them on all sides for their full length, including connections to other structural members, with materials having the required fire-resistance rating.

NYC **Exception:** Individual encasement protection may be omitted on those exposed sides where the extent of protection is in accordance with the required fire-resistance rating, as determined in Section 703.

**704.4 Protection of secondary members.** Secondary members that are required to have a fire-resistance rating shall be protected by individual encasement protection, by the membrane or ceiling of a horizontal assembly in accordance with Section 712, or by a combination of both.

**704.4.1 Light-frame construction.** King studs and boundary elements that are integral elements in load-bearing walls of light-frame construction shall be permitted to have required fire-resistance ratings provided by the membrane protection provided for the load-bearing wall.

**704.5 Truss protection.** The required thickness and construction of fire-resistance-rated assemblies enclosing trusses shall be based on the results of full-scale tests or combinations of tests on truss components or on approved calculations based on such tests that satisfactorily demonstrate that the assembly has the required fire resistance.

NYC **704.6 Attachments to structural members.** The edges of lugs, brackets, rivets and bolt heads attached to structural members shall be protected to the highest required fire-resistance rating of the members connected.

NYC **704.7 Reinforcing.** Thickness of protection for concrete or masonry reinforcement shall be measured to the outside of the reinforcement, including stirrups, ties and spiral reinforcing ties.

NYC **704.8 Embedments and enclosures.** Pipes, wires, conduits, ducts or other service facilities shall not be embedded in the required fire protection of a structural member that is required to be individually encased.

NYC **Exception:** Pipes, wires, and conduits may be installed in the space between the required fire protection and the structural member protected, provided that where such facilities pierce the required fire protection:

1. the area of the penetration does not exceed two percent of the area of the fire protection on any one face,
2. the penetrations are closed off with close-fitting metal escutcheons or plates, and
3. the concealed space is firestopped at each story.

**704.9 Impact protection.** Where the fire protective covering of a structural member is subject to impact damage from moving vehicles, the handling of merchandise or other activity, the fire protective covering shall be protected by corner guards or by a substantial jacket of metal or other noncombustible material to a height adequate to provide full protection, but not less than 5 feet (1524 mm) from the finished floor.

**Exception:** Corner protection is not required on concrete columns in open or enclosed parking garages.

**704.10 Exterior structural members.** Load-bearing structural members located within the exterior walls or exposed to the outside of a building or structure shall be provided with the highest fire-resistance rating as determined in accordance with the following:

1. As required by Table 601 for the type of building element based on the type of construction of the building;
2. As required by Table 601 for exterior bearing walls based on the type of construction; and
3. As required by Table 602 for exterior walls based on the fire separation distance.

**704.11 Lintel protection.** Lintels over openings wider than 4 feet (1219 mm) in masonry walls, other than in walls of masonry veneer on wood frame structures, shall be fire protected as required by Section 704.3 when the full load over the opening is not relieved by a masonry arch of required strength.

**Exceptions:‡**

1. The members of an assembled metal lintel that support only outer face masonry that is securely bonded or anchored to backing need not be fire protected, provided that the inner members of the assembly support the full load imposed.‡
2. The use of stone lintels in spans exceeding 4 feet (1219 mm) shall not be permitted unless supplemented by fire-protected structural members or masonry arches of the required strength to support the superimposed loads.‡

**704.12 Seismic isolation systems.** Fire-resistance ratings for the isolation system shall meet the fire-resistance rating required for the columns, walls or other structural elements in which the isolation system is installed in accordance with Table 601. Isolation systems required to have a fire-resistance rating shall be protected with approved materials or construction assemblies designed to provide the same degree of fire resistance as the structural element in which it is installed when tested in accordance with ASTM E 119 or UL 263 (see Section 703.2).

Such isolation system protection applied to isolator units shall be capable of retarding the transfer of heat to the isolator unit in such a manner that the required gravity load-carrying capacity of the isolator unit will not be impaired after exposure to the standard time-temperature curve fire test prescribed in ASTM E 119 or UL 263 for a duration not less than that required for the fire-resistance rating of the structure element in which it is installed.

Such isolation system protection applied to isolator units shall be suitably designed and securely installed so as not to dislodge, loosen, sustain damage or otherwise impair its ability to accommodate the seismic movements for which the isolator unit is designed and to maintain its integrity for the purpose of providing the required fire-resistance protection.

**704.13 Sprayed fire-resistant materials (SFRM).** Sprayed fire-resistant materials (SFRM) shall comply with Sections 704.13.1 through 704.13.5.

**704.13.1 Fire-resistance rating.** The application of SFRM shall be consistent with the fire-resistance rating and the listing, including, but not limited to, minimum thickness and dry density of the applied SFRM, method of application, substrate surface conditions and the use of bonding adhesives, sealants, reinforcing or other materials.

**704.13.2 Manufacturer's installation instructions.** The application of SFRM shall be in accordance with the manufacturer's installation instructions. The instructions shall include, but are not limited to, substrate temperatures and surface conditions and SFRM handling, storage, mixing, conveyance, method of application, curing and ventilation.

**704.13.3 Substrate condition.** The SFRM shall be applied to a substrate in compliance with Sections 704.13.3.1 through 704.13.3.2.

**704.13.3.1 Surface conditions.** Substrates to receive SFRM shall be free of dirt, oil, grease, release agents, loose scale and any other condition that prevents adhesion. The substrates shall also be free of primers, paints and encapsulants other than those fire tested and listed by a nationally recognized testing agency. Primed, painted or encapsulated steel shall be allowed, provided that testing has demonstrated that required adhesion is maintained.

**704.13.3.2 Primers, paints and encapsulants.** Where the SFRM is to be applied over primers, paints or encapsulants other than those specified in the listing, the material shall be field tested in accordance with ASTM E 736. Where testing of the SFRM with primers, paints or encapsulants demonstrates that required adhesion is maintained, SFRM shall be permitted to be applied to primed, painted or encapsulated wide flange steel shapes subject to the following conditions:

1. The beam flange width of such shape may not exceed 12 inches (305 mm);
2. The column flange width of such shape may not exceed 16 inches (400 mm);
3. The beam or column web depth of such shape may not exceed 16 inches (400 mm); and
4. The average and minimum bond strength values shall be determined based on a minimum of five bond tests conducted in accordance with ASTM E 736. Bond tests conducted in accordance with ASTM E 736 shall indicate a minimum average bond strength of 80 percent and a minimum individual bond strength of 50 percent, when compared to the bond strength of the SFRM as applied to clean uncoated  $\frac{1}{8}$ -inch-thick (3-mm) steel plate.

**704.13.4 Temperature.** A minimum ambient and substrate temperature of 40°F (4.44°C) shall be maintained during and for a minimum of 24 hours after the application of the SFRM, unless the manufacturer's installation instructions allow otherwise.

**704.13.5 Finished condition.** The finished condition of SFRM applied to structural members or assemblies shall

not, upon complete drying or curing, exhibit cracks, voids, spalls, delamination or any exposure of the substrate. Surface irregularities of SFRM shall be deemed acceptable.

## SECTION BC 705 EXTERIOR WALLS

**705.1 General.** Exterior walls shall comply with this section. Exterior wall construction shall comply with the provisions of Chapter 14 and Appendix D where applicable.

**705.2 Projections.** Cornices, eave overhangs, exterior balconies and similar projections, including but not limited to, fascias, belt courses, pilasters, surrounds, gutters, leaders, half-timber work, shutters, trellises, which extend beyond the exterior wall shall conform to the requirements of this section and Section 1406, provided, if removed or destroyed, will not reduce the structural stability of the building enclosure, and installed so as not to reduce the required fire-resistance rating of the enclosure. Exterior egress balconies and exterior exit stairways shall comply with the requirements of this section and Sections 1019 and 1026, respectively. Projections shall not extend beyond the distance determined by the following three methods, whichever results in the lesser projection:

1. A point one-third the distance from the exterior face of the wall to the tax lot line where protected openings or a combination of protected and unprotected openings are required in the exterior wall.
2. A point one-half the distance from the exterior face of the wall to the tax lot line where all openings in the exterior wall are permitted to be unprotected or the building is equipped throughout with an automatic sprinkler system installed under the provisions of Section 705.8.2.
3. More than 12 inches (305 mm) into areas where openings are prohibited.

**Exception:** Buildings on the same tax lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with this section.

**705.2.1 Type III, IV or V construction.** Projections from walls of Type III, IV or V construction shall be of any approved material.

**705.2.2 Combustible projections.** Combustible projections located where openings are not permitted or where protection of openings is required shall be of at least 1-hour fire-resistance-rated construction, Type IV construction, fire-retardant-treated wood or as required by Section 1406.3.

**705.3 Buildings on the same tax lot.** For the purposes of determining the required wall and opening protection and roof-covering requirements, buildings on the same tax lot shall be assumed to have an imaginary line between them.

**Exception:** Two or more buildings on the same tax lot shall either be regulated as separate buildings or shall be considered as portions of one building if the aggregate area of such buildings is within the limits specified in Chapter 5 for a single building. Where the buildings con-

tain different occupancy groups or are of different types of construction, the area shall be that allowed for the most restrictive occupancy or construction.

**705.4 Materials.** Exterior walls shall be of materials permitted by the building type of construction.

**705.5 Fire-resistance ratings.** Exterior walls shall be fire-resistance rated in accordance with Tables 601, 602, and Appendix D where applicable. The fire-resistance rating of exterior walls with a fire-separation distance of greater than 10 feet (3048 mm) shall be rated for exposure to fire from the inside. The required fire-resistance rating of exterior walls with a fire separation distance of less than or equal to 10 feet (3048 mm) shall be rated for exposure to fire from both sides.

**705.6 Structural stability.** The wall shall extend to the height required by Section 705.11 and shall have sufficient structural stability such that it will remain in place for the duration of time indicated by the required fire-resistance rating.

**705.7 Unexposed surface temperature.** Where protected openings are not limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of exterior walls as required by ASTM E 119 or UL 263 shall not apply. Where protected openings are limited by Section 705.8, the limitation on the rise of temperature on the unexposed surface of exterior walls as required by ASTM E 119 or UL 263 shall not apply provided that a correction is made for radiation from the unexposed exterior wall surface in accordance with the following formula:

$$A_e = A + (A_f \times F_{eo}) \quad (\text{Equation 7-1})$$

where:

$A_e$  = Equivalent area of protected openings.

$A$  = Actual area of protected openings.

$A_f$  = Area of exterior wall surface in the story under consideration exclusive of openings, on which the temperature limitations of ASTM E 119 or UL 263 for walls are exceeded.

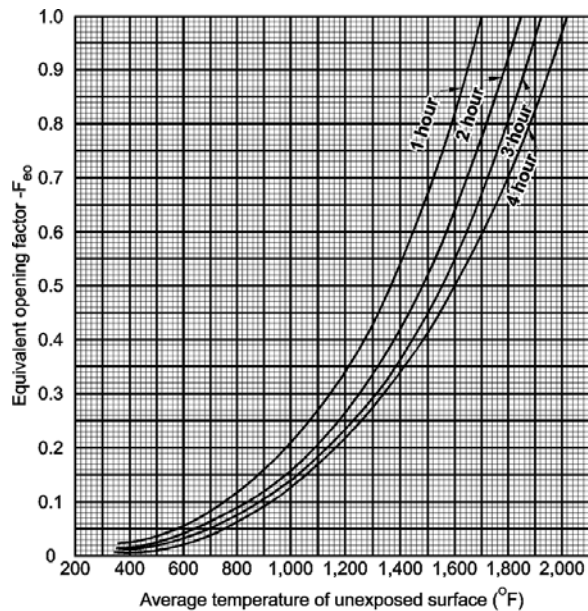
$F_{eo}$  = An "equivalent opening factor" derived from Figure 705.7 based on the average temperature of the unexposed wall surface and the fire-resistance rating of the wall.

**705.8 Openings.** Openings in exterior walls shall comply with Sections 705.8.1 through 705.8.7.

**705.8.1 Allowable area of openings.** The maximum area of unprotected and protected openings permitted in an exterior wall in any story of a building shall not exceed the percentages specified in Table 705.8.

**Exceptions:**

1. In other than Group H occupancies, unlimited unprotected openings are permitted in the first story above grade either:
  - 1.1. Where the wall faces a street and has a fire separation distance of more than 15 feet (4572 mm); or



For SI:  $^{\circ}\text{C} = [(^{\circ}\text{F}) - 32] / 1.8$ .

**FIGURE 705.7**  
**EQUIVALENT OPENING FACTOR**

1.2. Where the wall faces an unoccupied space, the unoccupied space shall be on the same tax lot or dedicated for public use, shall not be less than 30 feet (9144 mm) in width and shall have access from a street by a posted fire lane in accordance with the *New York City Fire Code*.

2. Buildings whose exterior bearing walls, exterior nonbearing walls and exterior primary structural frame are not required to be fire-resistance rated shall be permitted to have unlimited unprotected openings.

**705.8.2 Protected openings.** Where openings are required to be protected, fire doors and fire shutters shall comply with Section 715.4 and fire window assemblies shall comply with Section 715.5.

**Exception:** Opening protectives are not required where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 and the exterior openings are protected by a water curtain using automatic sprinklers approved for that use. The sprinklers and the water curtain shall be installed in accordance with NFPA 13, as modified in Appendix Q.

**705.8.3 Unprotected openings.** Where unprotected openings are permitted, windows and doors shall be constructed of any approved materials. Glazing shall conform to the requirements of Chapters 24 and 26.

**705.8.4 Mixed openings.** Where both unprotected and protected openings are located in the exterior wall in any story of a building, the total area of the openings shall be determined in accordance with the following formula:

$$(A_p/a_p) + (A_u/a_u) \leq 1 \quad (\text{Equation 7-2})$$



where:

$A_p$  = Actual area of protected openings, or the equivalent area of protected openings,  $A_e$  (see Section 705.7).

$a_p$  = Allowable area of protected openings.

$A_u$  = Actual area of unprotected openings.

$a_u$  = Allowable area of unprotected openings.

**705.8.5 Vertical separation of openings.** Openings in exterior walls in adjacent stories shall be separated vertically to protect against fire spread on the exterior of the buildings where the openings are within 5 feet (1524 mm) of each other horizontally. Such openings shall be separated vertically at least 3 feet (914 mm) by spandrel girders, exterior walls or other similar assemblies that have a fire-resistance rating of at least 1 hour or by flame barriers that extend horizontally at least 30 inches (762 mm) beyond the exterior wall and that are at least as wide as the opening. Flame barriers shall also have a fire-resistance rating of at least 1 hour. The unexposed surface temperature limitations specified in ASTM E 119 or UL 263 shall not apply to the flame barriers or vertical separation unless otherwise required by the provisions of this code. Where a curtain wall assembly is used on the exterior wall, the intersection between the floor assembly and curtain wall assembly shall be protected in accordance with Section 713.4.

**Exceptions:**

1. This section shall not apply to buildings that are three stories or less above grade plane.
2. This section shall not apply to buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
3. This section shall not apply to open parking garages.
4. This section shall not apply to Occupancy Group A, E, I or R.
5. This section shall not apply where the opening in the lower story is a protected opening with a fire protection rating of at least  $\frac{3}{4}$  hour.

**705.8.6 Vertical exposure.** For buildings on the same tax lot, opening protectives shall be provided in every opening that is less than 15 feet (4572 mm) vertically above the roof of an adjacent building or adjacent structure based on assuming an imaginary line between them. The opening protective are required where the fire separation distance between the imaginary line and the adjacent building or structure is less than 15 feet (4572 mm).

**Exceptions:**

1. Opening protectives are not required where the roof assembly of the adjacent building or structure has a fire-resistance rating of not less than 1 hour for a minimum distance of 10 feet (3048 mm) from the exterior wall facing the imaginary line and the entire length and span of the supporting elements for the fire-resistance-rated roof

assembly has a fire-resistance rating of not less than 1 hour.

2. Buildings on the same tax lot and considered as portions of one building in accordance with Section 705.3 are not required to comply with Section 705.8.6.

**705.9 Joints.** Joints made in or between exterior walls required by this section to have a fire-resistance rating shall comply with Section 714.

**Exception:** Joints in exterior walls that are permitted to have unprotected openings.

**705.9.1 Voids.** The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 714.4.

**705.10 Ducts and air transfer openings.** Penetrations by air ducts and air transfer openings in fire-resistance-rated exterior walls required to have protected openings shall comply with Section 716.

**Exception:** Foundation vents installed in accordance with this code are permitted.

**705.11 Parapets.** Parapets shall be provided on exterior walls of buildings.

**Exceptions:** A parapet need not be provided on an exterior wall where any of the following conditions exist:

1. The wall is not required to be fire-resistance rated in accordance with Table 602 because of fire separation distance.
2. The building has an area of not more than 1,000 square feet (93 m<sup>2</sup>) on any floor.
3. Walls that terminate at roofs of not less than 2-hour fire-resistance-rated construction.
4. One-hour fire-resistance-rated exterior walls that terminate at the underside of the roof sheathing, deck or slab, provided that the entire building is covered with a Class A roof covering. Such roof shall not have openings located within 10 feet (3048 mm) of the 1-hour fire-resistance-rated exterior wall and not within 5 feet (1524 mm) for Groups R and U.

4.1. Where the roof/ceiling framing elements are parallel to the walls, such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction for a width of 4 feet (1219 mm) measured from the interior side of the wall for Groups R and U and 10 feet (3048 mm) for other occupancies; or

4.2. Where roof/ceiling framing elements are not parallel to the wall, the entire span of such framing and elements supporting such framing shall not be of less than 1-hour fire-resistance-rated construction.

5. In occupancies of Groups R-2 and R-3, both provided with a Class A or B roof covering, the exterior wall shall be permitted to terminate at the roof sheathing or deck in Type III, IV and V construction provided:



# **FIRE AND SMOKE PROTECTION FEATURES**

**TABLE 705.8**  
**MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND**  
**DEGREE OF OPENING PROTECTION<sup>m</sup>**

NYC

FIRE SEPARATION DISTANCE (feet)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA <sup>a</sup>
0 to less than 3 <sup>b,c</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	Not Permitted
	Protected (P)	Not Permitted <sup>j,k</sup>
3 to less than 5 <sup>d,e</sup>	Unprotected, Nonsprinklered (UP, NS)	Not Permitted
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	15%
	Protected (P)	15% <sup>l</sup>
5 to less than 10 <sup>e,f</sup>	Unprotected, Nonsprinklered (UP, NS)	10% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	25%
	Protected (P)	25% <sup>l</sup>
10 to less than 15 <sup>e,f,g</sup>	Unprotected, Nonsprinklered (UP, NS)	15% <sup>h</sup>
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	45%
	Protected (P)	45% <sup>l</sup>
15 to less than 20 <sup>f,g</sup>	Unprotected, Nonsprinklered (UP, NS)	25%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	75%
	Protected (P)	75% <sup>l</sup>
20 to less than 25 <sup>f,g</sup>	Unprotected, Nonsprinklered (UP, NS)	45%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit <sup>l</sup>
25 to less than 30 <sup>f,g</sup>	Unprotected, Nonsprinklered (UP, NS)	70%
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	No Limit
	Protected (P)	No Limit <sup>l</sup>
30 or greater	Unprotected, Nonsprinklered (UP, NS)	No Limit
	Unprotected, Sprinklered (UP, S) <sup>i</sup>	Not Required
	Protected (P)	Not Required

For SI: 1 foot = 304.8 mm.

UP, NS = Unprotected openings in buildings not equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

UP, S = Unprotected openings in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

P = Openings protected with an opening protective assembly in accordance with Section 705.8.2.

a. Values indicated are the percentage of the area of the exterior wall, per story.

b. For the requirements for fire walls of buildings with differing heights, see Section 706.6.

c. For openings in a fire wall for buildings on the same tax lot, see Section 706.8.

d. The maximum percentage of unprotected and protected openings shall be 25 percent for Group R-3 occupancies.

e. Unprotected openings shall not be permitted for openings with a fire separation distance of less than 15 feet for Group H-2 and H-3 occupancies.

f. The area of unprotected and protected openings shall not be limited for Group R-3 occupancies, as applicable in Section 101.2, with a fire separation distance of 5 feet or more.

g. The area of openings in an open parking structure with a fire separation distance of 10 feet or greater shall not be limited.

h. Includes buildings accessory to Group R-3.

i. Not applicable to Group H-1, H-2 and H-3 occupancies.

j. Protected openings through a wall or walls between buildings shall comply with Section 705.8.

k. Protected openings within a fire separation distance of 3 feet or less are permitted for Occupancy Groups R-2 and R-3 provided such openings do not exceed 10 percent of the area of the façade of the story in which they are located. These openings shall not be credited towards meeting any mandatory natural light or ventilation requirements unless they also comply with applicable provisions of Chapter 12 and the *Zoning Resolution*.

l. In Group R-2 and R-3 occupancies with an exterior separation distance greater than 3 feet, openings shall be in accordance with percentages indicated as "Protected Classification of Opening" in Table 705.8. However, such openings shall not be required to be protected.

m. Upon special application, the commissioner may permit exterior wall openings to be constructed in excess of the permitted area established by Table 705.8 provided that such openings are protected and provided that at the time of their construction they are located at least 60 feet in a direct line, measured at any angle, including vertically and horizontally, from any neighboring building, unless otherwise permitted by Section 705.3 for buildings on the same tax lot. The construction class of the neighboring building shall not be factored into the measurement of the distance between the openings and adjoining building. If any neighboring building is later altered or constructed to come within the above distance limitation, the affected exterior openings shall immediately be closed with construction meeting the fire-resistance-rating requirements for exterior wall construction of the building in which they are located. Such additional openings shall not be credited toward meeting any of the mandatory natural light or ventilation requirements unless they also comply with applicable provisions of Chapter 12 and the *New York City Zoning Resolution*.

5.1. The roof sheathing or deck is constructed of approved noncombustible materials or of fire-retardant-treated wood, for a distance of 4 feet (1219 mm) from the perimeter; or

5.2. The roof is protected with 0.625-inch (16 mm) Type X gypsum board directly beneath the underside of the roof sheathing or deck, supported by a minimum of nominal 2-inch (51 mm) ledgers attached to the sides of the roof framing members, for a minimum distance of 4 feet (1219 mm).

6. Where the wall is permitted to have at least 25 percent of the exterior wall areas containing unprotected openings based on fire separation distance as determined in accordance with Section 705.8.

**705.11.1 Parapet construction.** Parapets shall have the same fire-resistance rating as that required for the supporting wall, and on any side adjacent to a roof surface, shall have noncombustible faces for the uppermost 18 inches (457 mm), including counterflashing and coping materials. The height of the parapet shall not be less than 30 inches (762 mm) above the point where the roof surface and the wall intersect. Where the roof slopes toward a parapet at a slope greater than two units vertical in 12 units horizontal (16.7-percent slope), the parapet shall extend to the same height as any portion of the roof within a fire separation distance where protection of wall openings is required, but in no case shall the height be less than 30 inches (762 mm).

**705.12 Portions of a building cantilevered over existing buildings.** Where a portion of a building is cantilevered over an adjacent building or tax lot by a horizontal distance greater than 1 foot (305 mm), the cantilevered portions shall be protected with construction that conforms to a fire engineering analysis acceptable to the commissioner that conforms to Section 705.12.1. In no case shall the protection for structural elements and horizontal assemblies be less than required for the construction class of the building. In no case shall the fire-resistance rating of exterior walls and the limitations for openings be less than required for a lot line condition pursuant to Table 705.8, including Note m.

**705.12.1 Analysis.** The analysis shall demonstrate that all portions of the building that cantilever will withstand the anticipated effects of a design fire in accordance with generally accepted fire engineering principles with respect to at least all of the following building elements:

1. The structural supports and frame of the cantilevered portion of the building;
2. The underside projecting assemblies of the cantilevered portion of the building; and
3. The exterior walls and openings on all sides of the cantilevered portion of the building.

**705.12.1.1 Criteria.** With respect to the design fire within the existing building over which the proposed

building is cantilevered, the analysis shall include a scenario to burn-out, where any active fire suppression systems do not operate, the fire department does not intervene, all interior vertical compartmentation, including at the entrances to the stairways, has been removed, and the fuel loading exceeds what is normally expected for the current occupancy by a factor of safety acceptable to the commissioner. Where there is no existing building below the cantilever, or where the existing building below the cantilever is significantly underbuilt, the commissioner may require additional data and analysis.

**705.12.2 Fire Department access to buildings and roofs.** The applicant shall submit to the department an approval from the Fire Department that the proposed cantilever complies with applicable provisions of the *New York City Fire Code* with respect to access to buildings and roofs.

## SECTION BC 706 FIRE WALLS

**706.1 General.** Each portion of a building separated by one or more fire walls that comply with the provisions of this section shall be considered a separate building. The extent and location of such fire walls shall provide a complete separation. Where a fire wall also separates occupancies that are required to be separated by a fire barrier wall, the most restrictive requirements of each separation shall apply. Concealed spaces in cornices and eaves shall comply with the provisions of Section 705.2.2.

**706.1.1 Party walls.** Any wall located on a property line between adjacent buildings, which is used or adapted for joint service between the two buildings, shall be constructed as a fire wall in accordance with Section 706, and shall create separate buildings.

**Exception:** Openings in a party wall separating an anchor building and a mall shall be in accordance with Section 402.7.3.

**706.1.2 Walls separating attached one- and two-family dwellings.** Attached one- and two-family dwellings shall be separated by walls constructed in accordance with Section 706 or Appendix M.

**706.2 Structural stability.** Fire walls shall have sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall for the duration of time indicated by the required fire-resistance rating.

**706.3 Materials.** Fire walls shall be constructed of any approved noncombustible materials.

**706.4 Fire-resistance rating.** Fire walls shall have a fire-resistance rating of not less than that required by Table 706.4.

**TABLE 706.4**  
**FIRE WALL FIRE-RESISTANCE RATINGS**

GROUP	FIRE-RESISTANCE RATING (hours)
A, B, E, H-4, I, R-1, R-2, U	3 <sup>a</sup>
F-1, H-3 <sup>b</sup> , H-5, M, S-1	3
H-1, H-2	4 <sup>b</sup>
F-2, S-2, R-3	2

- a. Walls shall be not less than 2-hour fire-resistance rated where separating buildings of Type II or V construction.  
b. For Group H-1, H-2 or H-3 buildings, also see Sections 415.4 and 415.5.

**706.5 Horizontal continuity.** Fire walls shall be continuous from exterior wall to exterior wall and shall extend at least 18 inches (457 mm) beyond the exterior surface of exterior walls.

**Exceptions:**

1. Fire walls shall be permitted to terminate at the interior surface of combustible exterior sheathing or siding provided the exterior wall has a fire-resistance rating of at least 1 hour for a horizontal distance of at least 4 feet (1219 mm) on both sides of the fire wall. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than  $\frac{3}{4}$  hour.
2. Fire walls shall be permitted to terminate at the interior surface of noncombustible exterior sheathing, exterior siding or other noncombustible exterior finishes provided the sheathing, siding, or other exterior noncombustible finish extends a horizontal distance of at least 4 feet (1219 mm) on both sides of the fire wall.
3. Fire walls shall be permitted to terminate at the interior surface of noncombustible exterior sheathing where the building on each side of the fire wall is protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

**706.5.1 Exterior walls.** Where the fire wall intersects the exterior walls, the fire-resistance rating and opening protection of the exterior walls shall comply with one of the following:

1. The exterior walls on both sides of the fire wall shall have a 1-hour fire-resistance rating with  $\frac{3}{4}$ -hour protection where opening protection is required by Section 705.8.† The fire-resistance rating of the exterior wall shall extend a minimum of 4 feet (1219 mm) on each side of the intersection of the fire wall to exterior wall. Exterior wall intersections at fire walls that form an angle equal to or greater than 180 degrees (3.14 rad) do not need exterior wall protection.
2. Buildings or spaces on both sides of the intersecting fire wall shall assume to have an imaginary lot line at the fire wall and extending beyond the exterior of the fire wall. The location of the assumed line in relation to the exterior walls and the fire wall shall be such that the exterior wall and opening protection

meet the requirements set forth in Sections 705.5 and 705.8. Such protection is not required for exterior walls terminating at fire walls that form an angle equal to or greater than 180 degrees (3.14 rad).

**706.5.2 Horizontal projecting elements.** Fire walls shall extend to the outer edge of horizontal projecting elements such as balconies, roof overhangs, canopies, marquees and architectural projections that are within 4 feet (1219 mm) of the fire wall.

**Exceptions:**

1. Horizontal projecting elements without concealed spaces provided the exterior wall behind and below the projecting element has not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting element on both sides of the fire wall. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than  $\frac{3}{4}$  hour.
2. Noncombustible horizontal projecting elements with concealed spaces, provided a minimum 1-hour fire-resistance-rated wall extends through the concealed space. The projecting element shall be separated from the building by a minimum of 1-hour fire-resistance-rated construction for a distance on each side of the firewall equal to the depth of the projecting element. The wall is not required to extend under the projecting element where the building exterior wall is not less than 1-hour fire-resistance rated for a distance on each side of the firewall equal to the depth of the projecting element. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than  $\frac{3}{4}$  hour.
3. For combustible horizontal projecting elements with concealed spaces, the fire wall need only extend through the concealed space to the outer edges of the projecting elements. The exterior wall behind and below the projecting element shall be of not less than 1-hour fire-resistance-rated construction for a distance not less than the depth of the projecting elements on both sides of the fire wall. Openings within such exterior walls shall be protected by opening protectives having a fire-protection rating of not less than  $\frac{3}{4}$  hour.

**706.6 Vertical continuity.** Fire walls shall extend from the foundation through the roof, to form a parapet at least 30 inches (762 mm) in height. Such parapet shall in no event extend to a point less than 4 inches (102 mm) above the highest point of peaked or gabled roof.

**Exceptions:**

1. Where a 2-hour fire wall is permitted in accordance with Table 706.4, such wall shall be permitted to terminate at the underside of the roof sheathing, deck or slab provided:

- NYC 1.1. The lower roof assembly within 4 feet (1219 mm) of the wall has not less than a 1-hour fire-resistance rating and the entire length and span of supporting elements for the rated roof assembly has a fire-resistance rating of not less than 1 hour; and
- NYC 1.2. Openings in the roof shall not be located within 4 feet (1219 mm) of the fire wall; and
- NYC 1.3. Each building shall be provided with not less than a Class A roof covering.
- NYC 2. In buildings of Type I or II construction, fire walls shall be permitted to terminate at the underside of noncombustible roof sheathing, deck, or slabs where both buildings are provided with not less than a Class A roof covering. Openings in the roof shall not be located within 4 feet (1219 mm) of the fire wall.
- NYC 3. In buildings of Type III, IV and V construction, fire walls shall be permitted to terminate at the underside of noncombustible roof sheathing or decks provided:
- NYC 3.1. There are no openings in the roof within 4 feet (1219 mm) of the fire wall; and
- NYC 3.2. The roof is covered with a minimum Class A roof covering.
- NYC 4. Buildings located above a parking garage designed in accordance with Section 510.2 shall be permitted to have the fire walls for the buildings located above the parking garage extend from the horizontal separation between the parking garage and the buildings.

**706.7 Combustible framing in fire walls.** Adjacent combustible members entering into a concrete or masonry firewall from opposite sides shall not have less than a 4-inch (102 mm) distance between embedded ends. Where combustible members frame into hollow walls or walls of hollow units, hollow spaces shall be solidly filled for the full thickness of the wall and for a distance not less than 4 inches (102 mm) above, below and between the structural members, with noncombustible materials approved for fireblocking.

NYC **706.8 Openings.** Each opening through a fire wall, a party wall, or a through wall between two buildings shall be protected in accordance with Section 715.4 and shall not exceed 156 square feet (15 m<sup>2</sup>), with no dimension greater than 12 feet (3658 mm). The aggregate width of openings at any floor level shall not exceed 25 percent of the length of the wall.

NYC **Exception:** Openings shall not be limited to 156 square feet (15 m<sup>2</sup>) where both buildings are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1. However, the aggregate width of all openings at any one floor level shall not exceed 25 percent of the length of the wall.

NYC **706.9 Penetrations.** Penetrations through fire walls shall comply with Section 713.

**706.10 Joints.** Joints made in or between fire walls shall comply with Section 714.

**706.11 Ducts and air transfer openings.** Ducts and air transfer openings shall not penetrate fire walls.

**Exception:** Penetrations by ducts and air transfer openings of fire walls that are not on a tax lot line shall be allowed provided the penetrations comply with Section 716. The size and aggregate width of all openings shall not exceed the limitations of Section 706.8.

NYC

## SECTION BC 707 FIRE BARRIERS

**707.1 General.** Fire barriers installed as required elsewhere in this code or the *New York City Fire Code*, shall comply with this section.

NYC

**707.2 Materials.** Fire barriers shall be of materials permitted by the building type of construction.

**707.3 Fire-resistance rating.** The fire-resistance rating of fire barriers shall comply with this section.

**707.3.1 Shaft enclosures.** The fire-resistance rating of the fire barrier separating building areas from a shaft shall comply with Section 708.4.

**707.3.2 Exit enclosures.** The fire-resistance rating of the fire barrier separating building areas from an exit shall comply with Section 1022.1.

**707.3.3 Exit passageway.** The fire-resistance rating of the fire barrier separating building areas from an exit passageway shall comply with Section 1023.1.

**707.3.4 Horizontal exit.** The fire-resistance rating of the separation between building areas connected by a horizontal exit shall comply with Section 1025.1.

**707.3.5 Atriums.** The fire-resistance rating of the fire barriers separating atriums shall comply with Section 404.6.

NYC

**707.3.6 Incidental uses.** The fire barrier separating incidental uses from other spaces in the building shall have a fire-resistance rating of not less than that indicated in Table 509.

NYC

**707.3.7 Control areas.** Fire barriers separating control areas shall have a fire-resistance rating of not less than required in Section 414.2.4.

NYC

**707.3.8 Separated occupancies.** Where the provisions of Section 508.4 are applicable, the fire barrier separating mixed occupancies shall have a fire-resistance rating of not less than that indicated in Section 508.4 based on the occupancies being separated.

NYC

**707.3.9 Fire areas.** The fire barriers or horizontal assemblies, or both, separating a single occupancy into different fire areas shall have a fire-resistance rating of not less than that indicated in Table 707.3.9. The fire barriers or horizontal assemblies, or both, separating fire areas of mixed occupancies shall have a fire-resistance rating of not less than the highest value indicated in Table 707.3.9 for the occupancies under consideration.



**TABLE 707.3.9**  
**FIRE-RESISTANCE RATING REQUIREMENTS FOR FIRE**  
**BARRIER ASSEMBLIES OR HORIZONTAL ASSEMBLIES**  
**BETWEEN FIRE AREAS**

OCCUPANCY GROUP	FIRE-RESISTANCE RATING (hours)
H-1, H-2	4
F-1, H-3, S-1	3
A, B, E, F-2, H-4, H-5, I, M, R, S-2	2
U	1

**707.4 Exterior walls.** Where exterior walls serve as a part of a required fire-resistance-rated shaft or exit enclosure, or separation, such walls shall comply with the requirements of Section 705 for exterior walls, and the fire-resistance-rated enclosure or separation requirements shall not apply.

**Exception:** Exterior walls required to be fire-resistance rated in accordance with Section 1019.2 for exterior egress balconies, Section 1022.6 for exit enclosures and Section 1026.6 for exterior exit ramps and stairways.

**707.5 Continuity.** Fire barriers shall extend from the top of the floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above and shall be securely attached thereto. Such fire barriers shall be continuous through concealed spaces, such as the space above a suspended ceiling.

**707.5.1 Supporting construction.** The supporting construction for a fire barrier shall be protected to afford the required fire-resistance rating of the fire barrier supported. Hollow vertical spaces within a fire barrier shall be fire-blocked in accordance with Section 717.2 at every floor level.

**Exceptions:**

1. The maximum required fire-resistance rating for assemblies supporting fire barriers separating tank storage as provided for in Section 415.6.2.1 shall be 2 hours, but not less than required by Table 601 for the building construction type.
2. Shaft enclosures shall be permitted to terminate at a top enclosure complying with Section 708.12.
3. Supporting construction for 1-hour fire barriers required by Table 509 in buildings of Type IIB, IIIB and VB construction is not required to be fire-resistance rated unless required by other sections of this code.

**707.6 Openings.** Openings in a fire barrier shall be protected in accordance with Section 715. Openings shall be limited to a maximum aggregate width of 25 percent of the length of the wall, and the maximum area of any single opening shall not exceed 156 square feet (15 m<sup>2</sup>). Openings in vertical exit enclosures and exit passageways shall also comply with Sections 1022.3 and 1023.5, respectively.

**Exceptions:**

1. Openings shall not be limited to 156 square feet (15 m<sup>2</sup>) where adjoining floor areas are equipped

throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

2. Openings for fire doors serving an exit enclosure shall not be limited to 156 square feet (15 m<sup>2</sup>) or an aggregate width of 25 percent of the length of the wall. **NYC**
3. Openings shall not be limited to 156 square feet (15 m<sup>2</sup>) or an aggregate width of 25 percent of the length of the wall where the opening protective has been tested in accordance with ASTM E 119 or UL 263 and has a minimum fire-resistance rating not less than the fire-resistance rating of the wall. **NYC**
4. Fire window assemblies permitted in atrium separation walls shall not be limited to a maximum aggregate width of 25 percent of the length of the wall.
5. Openings shall not be limited to 156 square feet (15 m<sup>2</sup>) or an aggregate width of 25 percent of the length of the wall where the opening protective is a fire door assembly in a fire barrier separating an exit enclosure from an exit passageway in accordance with Section 1022.2.1.
6. Openings permitted in atrium enclosures shall comply with the provisions of Section 404.5. **NYC**

**707.7 Penetrations.** Penetrations of fire barriers shall comply with Section 713.

**707.7.1 Prohibited penetrations.** Penetrations into an exit enclosure or an exit passageway shall be allowed when permitted by Sections 1022.4 or 1023.6, respectively. **NYC**

**707.8 Joints.** Joints made in or between fire barriers, and joints made at the intersection of fire barriers with underside of the floor or roof sheathing, slab or deck above, shall comply with Section 714.

**707.9 Ducts and air transfer openings.** Penetrations in a fire barrier by ducts and air transfer openings shall comply with Section 716.

**707.9.1 Prohibited ducts and air transfer openings.** Penetrations by ducts and air transfer openings into an exit enclosure shall only be allowed when permitted by Sections 1022.4 and 1023.6. **NYC**

## **SECTION BC 708**

### **SHAFT ENCLOSURES**

**708.1 General.** The provisions of this section shall apply to shafts required to protect openings and penetrations through floor/ceiling and roof/ceiling assemblies. Shaft enclosures shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies in accordance with Section 712, or both.

**708.2 Shaft enclosure required.** Openings through a floor/ceiling assembly shall be protected by a shaft enclosure complying with this section.

**Exceptions:**

- |                          |  |                          |
|--------------------------|--|--------------------------|
| NYC<br>NYC<br>NYC<br>NYC | 1. A shaft enclosure is not required for openings totally within an individual residential dwelling unit and connecting four stories or less where such dwelling unit is fully sprinklered in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3.   | NYC                      |
| NYC<br>NYC               | 2. A shaft enclosure is not required in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 for an escalator opening or stairway which is not a portion of the means of egress protected according to Item 2.1 or 2.2:  | NYC<br>NYC<br>NYC<br>NYC |
| NYC<br>NYC               | 2.1. Where the area of the floor opening between stories does not exceed twice the horizontal projected area of the escalator or stairway and the opening is protected by a draft curtain and closely spaced sprinklers in accordance with NFPA 13, as modified in Appendix Q. In other than Groups B and M, this application is limited to openings that do not connect more than four stories.   | NYC<br>NYC<br>NYC<br>NYC |
| NYC                      | 2.2. Where the opening is protected by approved power-operated automatic shutters at every penetrated floor. The shutters shall be of noncombustible construction and have a fire-resistance rating of not less than 1.5 hours. The shutter shall be so constructed as to close immediately upon the actuation of a smoke detector installed in accordance with Section 907.3 and shall completely shut off the well opening. Escalators shall cease operation when the shutter begins to close. The shutter shall operate at a speed of not more than 30 feet per minute (152.4 mm/s) and shall be equipped with a sensitive leading edge to arrest its progress where in contact with any obstacle, and to continue its progress on release therefrom. | NYC                      |
| NYC                      | 3. A shaft enclosure is not required for penetrations by pipe, tube, conduit, wire, cable, and vents protected in accordance with Section 713.4.   | NYC                      |
| NYC                      | 4. A shaft enclosure is not required for penetrations by ducts protected in accordance with Section 716.6. Grease ducts shall be protected in accordance with the <i>New York City Mechanical Code</i> .   | NYC                      |
| NYC                      | 5. In other than Group H occupancies, a shaft enclosure is not required for floor openings complying with the provisions for atriums in Section 404.   | NYC                      |
| NYC                      | 6. A shaft enclosure is not required for approved masonry chimneys, where annular space is fire-blocked at each floor level in accordance with Section 717.2.5.  | NYC                      |
| NYC                      | 7. In other than Groups I-2 and I-3, a shaft enclosure is not required for a floor opening or an air transfer opening that complies with all of the following:   | NYC                      |
| NYC                      | 7.1. Does not connect more than two stories.   | NYC                      |
| NYC                      | 7.2. Is not part of the required means of egress system.   | NYC                      |
| NYC                      | 7.3. Is not concealed within the building construction of a wall or floor/ceiling assembly.  | NYC                      |
| NYC                      | 7.4. Is not open to a corridor in Group I and R occupancies where such corridor is required to be fire-resistance rated in accordance with Tables 1018.1.1 and 1018.1.2.   | NYC<br>NYC<br>NYC<br>NYC |
| NYC                      | 7.5. Is not open to a corridor on nonsprinklered floors in any occupancy where such corridor is required to be fire-resistance rated in accordance with Tables 1018.1.1 and 1018.1.2.  | NYC<br>NYC<br>NYC<br>NYC |
| NYC                      | 7.6. Is separated from floor openings and air transfer openings serving other floors by construction conforming to required shaft enclosures.  | NYC                      |
| NYC                      | 7.7. Is limited to the same smoke compartment.   | NYC                      |
| NYC                      | 8. A shaft enclosure is not required for automobile ramps in open and enclosed parking garages constructed in accordance with Sections 406.3 and 406.4, respectively.  | NYC                      |
| NYC                      | 9. A shaft enclosure is not required for floor openings between a mezzanine and the floor below.   | NYC                      |
| NYC                      | 10. A shaft enclosure is not required for joints protected by a fire-resistant joint system in accordance with Section 714.  | NYC                      |
| NYC                      | 11. A shaft enclosure shall not be required for floor openings created by unenclosed stairs or ramps in accordance with Exception 3 or 4 in Section 1016.1.  | NYC                      |
| NYC                      | 12. Floor openings protected by floor fire doors in accordance with Section 712.8.   | NYC                      |
| NYC                      | 13. In Group I-3 occupancies, a shaft enclosure is not required for floor openings in accordance with Section 408.5.   | NYC                      |
| NYC                      | 14. A shaft enclosure is not required for elevator hoistways in open or enclosed parking garages that serve only the parking garage.   | NYC                      |
| NYC                      | 15. In open or enclosed parking garages, a shaft enclosure is not required to enclose mechanical exhaust or supply duct systems when such duct system is contained within and serves only the parking garage.  | NYC                      |
| NYC                      | 16. Where permitted by other sections of this code.  | NYC                      |

**708.3 Materials.** The shaft enclosure shall be of materials permitted by the building type of construction.

**Exception:** Noncombustible materials shall be used for shaft enclosures in Group I-1, R-1 and R-2 buildings irrespective of the building type of construction.

**708.4 Fire-resistance rating.** Shaft enclosures shall have a fire-resistance rating of not less than 2 hours where penetrating three stories or more and not less than 1 hour where penetrating fewer than three stories. The number of stories connected by the shaft enclosure shall include any basements or cellars, but not any mezzanines. Shaft enclosures shall have a fire-resistance rating not less than the floor assembly penetrated, but need not exceed 2 hours. Shaft enclosures shall meet the requirements of Section 703.2.

**708.5 Continuity.** Shaft enclosures shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712 or both. Where the roof construction is of combustible materials, shaft enclosure walls shall extend through the roof construction at least 30 inches (762 mm) above the roof. Where the roof construction is of noncombustible materials, shaft enclosure walls shall extend from the top of the floor/ceiling assembly below to the underside of the floor or roof slab or deck above and shall be securely attached thereto. These walls shall be continuous through concealed spaces such as the space above a suspended ceiling. The supporting construction shall be protected to afford the required fire-resistance rating of the element supported. Hollow vertical spaces within the shaft enclosure construction wall shall be fire-stopped at every floor level.

**Exception:** A shaft enclosure of a refuse or laundry chute shall extend through combustible or noncombustible roof construction at least 6 feet (1829 mm) above the roof.

**708.6 Exterior walls.** Where exterior walls serve as a part of a required shaft enclosure, such walls shall comply with the requirements of Section 705 for exterior walls and the fire-resistance-rated enclosure requirements of Section 707.4 shall not apply.

**Exception:** Exterior walls required to be fire-resistance rated in accordance with Section 1019.2 for exterior egress balconies, Section 1022.6 for exit enclosures and Section 1026.6 for exterior exit ramps and stairways.

**708.7 Openings.** Openings in a shaft enclosure shall be protected in accordance with Section 715 as required for fire barriers. Doors shall be self-closing or automatic-closing by smoke detection in accordance with Section 715.4.8.3. Automatic-closing by smoke detection is not permitted for doors serving vertical exit enclosures.

**Exception:** For no more than one vertical exit enclosure in a building, doors serving such enclosure may be automatic-closing by smoke detection provided that the following conditions are satisfied:

1. The building contains no Group H space and:

- 1.1. Is not a high-rise building pursuant to Section 403.1 of this code, or for the purposes of prior code buildings, Section 27-232 of the *Administrative Code*, and is equipped with a fire alarm system; or

- 1.2. Is equipped with fire alarm systems and automatic sprinkler systems throughout; or

- 1.3. Is a high-rise office building, as such term is defined in Section 27-232 of the *Administrative Code*, that is 100 feet (30 480 mm) or more in height, equipped with a fire alarm system and subdivided into compartments pursuant to subdivision c of Section 27-339 of the *Administrative Code*.

2. Such doors serve no more than three levels within such vertical exit enclosure, which must be consecutive levels.
3. All levels served by such doors are served by at least one other exit.
4. Such doors are connected to a fire alarm system and installed in accordance with Section 715.4.8.3 and NFPA 80.
5. The hold-open devices of such doors:
  - 5.1. Are capable of manual release at the fire command center or, if a fire command center is not required, at a fire alarm control panel that is near the main building entrance; and
  - 5.2. Are capable of manual release by pulling the doors to the closed position.

**708.7.1 Prohibited openings.** Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

**708.8 Penetrations.** Penetrations in a shaft enclosure shall be protected in accordance with Section 713 as required for fire barriers.

**708.8.1 Prohibited penetrations.** Penetrations other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.

**708.9 Joints.** Joints in a shaft enclosure shall comply with Section 714.

**708.10 Ducts and air transfer openings.** Penetrations of a shaft enclosure by ducts and air transfer openings shall comply with Section 716.

**708.11 Enclosure at the bottom.** Shafts that do not extend to the bottom of the building or structure shall comply with one of the following:

1. They shall be enclosed at the lowest level with construction of the same fire-resistance rating as the lowest floor through which the shaft passes, but not less than the rating required for the shaft enclosure; or
2. They shall terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The fire-resistance rating and opening protectives shall be at least equal to the protection required for the shaft enclosure.

**Exceptions:**

1. The fire-resistance-rated room separation is not required provided there are no openings in or

penetrations of the shaft enclosure to the interior of the building except at the bottom. The bottom of the shaft shall be closed off around the penetrating items with materials permitted by Section 717.3.1 for draftstopping, or the room shall be provided with an approved automatic fire suppression system.

2. A shaft enclosure containing a refuse chute or laundry chute shall not be used for any other purpose and shall terminate in a room protected in accordance with Section 708.13.4.
3. The fire-resistance-rated room separation and the protection at the bottom of the shaft are not required provided there are no combustibles in the shaft and there are no openings or other penetrations through the shaft enclosure to the interior of the building.

**708.12 Enclosure at the top.** Shafts that do not extend to the top of the building or structure shall:

1. Be enclosed at the highest level with construction of the same fire-resistance rating as the highest floor through which the shaft passes, but not less than the rating required for the shaft enclosure; or
2. Terminate in a room having a use related to the purpose of the shaft. The room shall be separated from the remainder of the building by construction having a fire-resistance rating and opening protective at least equal to the protection required for the shaft enclosure.

**708.12.1 Smoke venting of stair and other closed shafts.** All closed shafts, including vertical exit enclosures, having a floor area exceeding 4 square feet (0.37 m<sup>2</sup>) shall be provided with a smoke vent in accordance with Sections 708.12.1.1 through 708.12.1.3.

**Exception:** Elevator and dumbwaiter shafts in accordance with Chapter 30.

**708.12.1.1 Smoke vent construction.** Smoke vents may be constructed as windows, louvers, skylights, vent ducts, or similar devices. Where a vent duct is installed, such vent ducts shall be enclosed by construction having the same fire-resistance rating as required for the shaft enclosure.

**708.12.1.2 Smoke vent dimensions.** The effective venting area shall not be less than 3½ percent of the maximum shaft area at any floor, but in no event less than 72 square inches (0.05 m<sup>2</sup>).

**708.12.1.3 Smoke vent location.** Smoke vents shall be located in accordance with Section 708.12.1.3.1 or 708.12.1.3.2, as applicable.

**708.12.1.3.1 Smoke vents located above the roof line.** Where a closed shaft or smoke vent duct penetrates through the roof of the building, the vent shall be located as follows:

1. The vent shall be located at least 8 inches (203 mm) above a noncombustible roof assembly

or at least 36 inches (914 mm) above a combustible roof assembly.

2. The vent shall be located at least 10 feet (3048 mm) from any window, door, exterior stairway, or interior lot line. The vent may be located no less than 5 feet (1524 mm) from any window or door provided that the vent is located at a point higher than the top of such window or door.
3. Where the vent is constructed as a window or louver, the sill of the window or louver shall be located at least 36 inches (914 mm) above the roof assembly.

**708.12.1.3.2 Smoke vents located in an exterior wall.** Where the exterior wall serves as part of a shaft enclosure or where a smoke vent duct penetrates the exterior wall of the building, no openings shall be located in the wall within a distance of 30 feet (9144 mm) vertically above the vent opening, nor within 5 feet (1524 mm) on either side of the vent opening.‡

**708.13 Refuse and laundry chutes.** Refuse and laundry chutes, access and termination rooms and incinerator rooms shall meet the requirements of Sections 708.13.1 through 708.13.6.

**Exception:** Chutes serving and contained within a single dwelling unit.

**708.13.1 Refuse and laundry chute enclosures.** A shaft enclosure containing a refuse or laundry chute shall not be used for any other purpose and shall have a fire-resistance rating of 2 hours. Openings into the shaft, including those from access rooms and termination rooms, shall be protected in accordance with this section and Section 715. Openings into chutes shall not be located in corridors. Doors shall be self-closing.

**708.13.2 Materials.** A shaft enclosure containing a refuse or laundry chute shall be constructed of noncombustible materials.

**708.13.3 Refuse and laundry chute access rooms.** Access openings for refuse and laundry chutes shall be located in dedicated rooms or compartments enclosed by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. Openings into the access rooms shall be protected by opening protectives having a fire protection rating of not less than 1½ hour.‡ Doors shall be self closing except that where the storage of refuse, including recyclables or laundry, is not permitted in such access rooms, doors may be automatic closing upon the detection of smoke in accordance with Section 715.4.8.3.‡

**Exception:** Access openings for refuse or laundry chutes located within a dwelling unit need not be located within a separate room or compartment.



**708.13.4 Termination room.** Refuse and laundry chutes shall discharge into an enclosed room separated from the remainder of the building by not less than 3-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. Openings into the termination room shall be protected by opening protectives having a fire protection rating of not less than 1½ hours. Doors shall be self-closing.

**Exception:** Opening protectives‡ shall not be required at a refuse or laundry chute opening to a termination room.

**708.13.5 Incinerator room.** Incinerator rooms shall comply with Table 509.

**708.13.6 Automatic fire sprinkler system.** An approved automatic fire sprinkler system shall be installed in accordance with Section 903.2.11.6.‡

**708.14 Elevator, dumbwaiter and other hoistways.** Elevator, dumbwaiter, and other hoistway enclosures shall be constructed in accordance with Section 708 and Chapter 30.

**708.14.1 Elevator lobby.** Except as provided by Sections‡ 403.6.1 and 403.6.2, an enclosed elevator lobby shall be provided in high rise buildings at the following locations:

1. Elevators opening onto a fire-resistance-rated corridor, in all occupancy groups.
2. Elevators serving Group B occupancies. Elevators that serve four or more stories that contain space classified in occupancy Group B, inclusive of any lobby or entrance level, shall provide elevator lobbies at every level served by such elevator.

The lobby enclosure shall separate the elevator shaft enclosure doors from each floor by smoke partitions. In addition to the requirements in Section 709 for fire partitions, doors protecting openings in the elevator lobby enclosure walls shall also comply with Section 711.5.3 and penetrations of the elevator lobby enclosure by ducts and air transfer openings shall be protected in accordance with Section 711.7. Elevator lobbies shall have at least one means of egress complying with Chapter 10 and other provisions within this code. Access to an exit on any story through an elevator lobby shall be permitted provided that access to at least one other required exit does not require passing through the elevator lobby.

**Exceptions:**

1. Enclosed elevator lobbies are not required at the street floor, provided the entire street floor is equipped with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Elevators not required to be located in a shaft in accordance with Section 708.2 are not required to have enclosed elevator lobbies.
3. Enclosed elevator lobbies are not required where zero-clearance doors are provided at the hoistway opening in accordance with Section 3002.6. Such

doors shall be tested in accordance with UL 1784 without an artificial bottom seal.

4. Enclosed elevator lobbies are not required on floors with less than 2,500 square feet (232 m²), provided that the commissioner accepts an alternative design or construction method that accomplishes the purposes of this section, or provided that the commissioner determines that compliance with this section is impracticable in whole or in part, whereby the commissioner may authorize an exemption from the requirements of this section.
5. Enclosed elevator lobbies are not required on Group R-2 occupied floors.
6. Enclosed elevator lobbies are not required where the elevator hoistway is pressurized in accordance with Section 708.14.2.
7. Enclosed elevator lobbies are not required where the elevator serves only open parking garages in accordance with Section 406.3.

**708.14.1.1 Areas of rescue assistance.** Areas of rescue assistance shall be provided as required in Section 1007.6.

**708.14.2 Enclosed elevator lobby.** Where elevator hoistway pressurization is provided in lieu of required enclosed elevator lobbies, the pressurization system shall comply with this section except as provided by Sections‡ 403.6.1 and 403.6.2.

**708.14.2.1 Pressurization requirements.** Elevator hoistways shall be pressurized to maintain a minimum positive pressure of 0.10 inches of water (25 Pa) and a maximum positive pressure of 0.25 inches of water (67 Pa) with respect to adjacent occupied space on all floors. This pressure shall be measured at the midpoint of each hoistway door, with all elevator cars at the floor of recall and all hoistway doors on the floor of recall open and all other hoistway doors closed. The opening and closing of hoistway doors at each level must be demonstrated during this test. The supply air intake shall be from an outside, uncontaminated source located a minimum distance of 20 feet (6096 mm) from any air exhaust system or outlet.

**708.14.2.2 Rational analysis.** A rational analysis complying with Section 909.4 shall be submitted with the construction documents.

**708.14.2.3 Ducts for system.** Any duct system that is part of the pressurization system shall be protected with the same fire-resistance rating as required for the elevator shaft enclosure.

**708.14.2.4 Fan system.** The fan system provided for the pressurization system shall be as required by this section.

**708.14.2.4.1 Fire resistance.** When located within the building, the fan system that provides the pressurization shall be protected with the same fire-

resistance rating required for the elevator shaft enclosure.

**708.14.2.4.2 Smoke detection.** The fan system shall be equipped with a smoke detector that will automatically shut down the fan system when smoke is detected within the system.

**708.14.2.4.3 Separate systems.** A separate fan system shall be used for each elevator hoistway.

**708.14.2.4.4 Fan capacity.** The supply fan shall either be adjustable with a capacity of at least 1,000 cfm (0.4719 m<sup>3</sup>/s) per door, or that specified by a registered design professional to meet the requirements of a designed pressurization system.

**708.14.2.5 Standby power.** The pressurization system shall be provided with standby power from the same source as other required emergency systems for the building.

**708.14.2.6 Activation of pressurization system.** The elevator pressurization system shall be activated upon activation of the building fire alarm system or upon activation of the elevator lobby smoke detectors. Where both a building fire alarm system and elevator lobby smoke detectors are present, each shall be independently capable of activating the pressurization system.

**708.14.2.7 Special inspection.** Special inspection for performance shall be required in accordance with Section 909.18.8. System acceptance shall be in accordance with Section 909.19.

**708.14.2.8 Marking and identification.** Detection and control systems shall be marked in accordance with Section 909.14.

**708.14.2.9 Control diagrams.** Control diagrams shall be provided in accordance with Section 909.15.

**708.14.2.10 Control panel.** A control panel complying with Section 909.16 shall be provided.

**708.14.2.11 System response time.** Hoistway pressurization systems shall comply with the requirements for smoke control system response time in Section 909.17.

## SECTION BC 709 FIRE PARTITIONS

**709.1 General.** The following wall assemblies shall comply with this section.

1. Walls separating tenant spaces in covered mall buildings as required by Section 402.7.2.
2. Corridor walls as required by Section 1018.1.

**709.2 Materials.** The walls shall be of materials permitted by the building type of construction.

**709.3 Fire-resistance rating.** Fire partitions shall have a fire-resistance rating of not less than 1 hour.

**Exception:** Interior corridor walls as permitted by Table 1018.1.1.

**709.4 Continuity.** Fire partitions shall extend from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, slab or deck above or to the fire-resistance-rated floor/ceiling or roof/ceiling assembly above, and shall be securely attached thereto. If the partitions are not continuous to the sheathing, deck, or slab, the space between the ceiling and the sheathing, deck or slab above shall be fire blocked or draft stopped in accordance with Sections 717.2.1 and 717.3.1 at the partition line. The supporting construction shall be protected to afford the required fire-resistance rating of the wall supported.

### Exceptions:

1. The fire partition separating tenant spaces in a mall, complying with Section 402.7.2, is not required to extend beyond the underside of a ceiling that is not part of a fire-resistance-rated assembly. A wall is not required in attic or ceiling spaces above tenant separation walls.
2. Fireblocking or draftstopping is not required at the partition line in Group R-2 buildings that do not exceed four stories above grade plane provided the attic space is subdivided by draftstopping into areas not exceeding 3,000 square feet (279 m<sup>2</sup>) or above every two dwelling units, whichever is smaller.
3. Fireblocking or draftstopping is not required at the partition line in buildings equipped with an automatic sprinkler system installed throughout in accordance with Section 903.3.1.1 or 903.3.1.2 provided that automatic sprinklers are installed in combustibles floor/ceiling and roof/ceiling spaces.

**709.5 Exterior walls.** Where exterior walls serve as a part of a required fire-resistance-rated separation, such walls shall comply with the requirements of Section 705 for exterior walls and the fire-resistance-rated separation requirements shall not apply.

**Exception:** Exterior walls required to be fire-resistance-rated in accordance with Section 1019.2 for exterior egress balconies, Section 1022.6 for exit enclosures and Section 1026.6 for exterior exit ramps and stairways.

**709.6 Openings.** Openings in a fire partition shall be protected in accordance with Section 715.

**709.7 Penetrations.** Penetrations through fire partitions shall comply with Section 713.

**709.8 Joints.** Joints made in or between fire partitions shall comply with Section 714.

**709.9 Ducts and air transfer openings.** Penetrations by ducts and air transfer openings shall comply with Section 716.

## SECTION BC 710 SMOKE BARRIERS

**710.1 General.** Smoke barriers shall comply with this section.

**710.2 Materials.** Smoke barriers shall be of materials permitted by the building type of construction.

**710.3 Fire-resistance rating.** A 1-hour fire-resistance rating is required for smoke barriers.

**Exception:** Smoke barriers constructed of minimum 0.10-inch-thick (2.5 mm) steel in Group I-3 buildings.

**710.4 Continuity.** Smoke barriers shall form an effective membrane continuous from outside wall to outside wall and from the top of the foundation or floor/ceiling assembly below to the underside of the floor or roof sheathing, deck, or slab above, including continuity through concealed spaces, such as those found above suspended ceilings, and interstitial structural and mechanical spaces. The supporting construction shall be protected to afford the required fire-resistance rating of the wall or floor supported in buildings of other than Type IIB, IIIB or VB construction.

**Exception:** Smoke barrier walls are not required in interstitial spaces where such spaces are designed and constructed with ceilings that provide resistance to the passage of fire and smoke equivalent to that provided by the smoke barrier walls.

**710.5 Openings.** Openings in a smoke barrier shall be protected in accordance with Section 715.

**Exceptions:**

1. In Group I-2, where doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with fire-protection-rated glazing materials in approved fire-resistance-rated frames, the area of which shall not exceed that tested. The doors shall be close fitting within operational tolerances, and shall not have undercuts in excess of  $\frac{3}{4}$ -inch, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meeting edges and shall be automatic-closing by smoke detection in accordance with Section 715.4.8.3. Where permitted by the door manufacturer's listing, positive-latching devices are not required.
2. In Group I-2, horizontal sliding doors installed in accordance with Section 1008.1.4.3 and protected in accordance with Section 715.

**710.6 Penetrations.** Penetrations through smoke barriers shall comply with Section 713.

**710.7 Joints.** Joints made in or between smoke barriers shall comply with Section 714.

**710.8 Duct and air transfer openings.** Penetrations by duct and air transfer openings shall comply with Section 716.

## SECTION BC 711 SMOKE PARTITIONS

**711.1 General.** Smoke partitions installed as required elsewhere in the code shall comply with this section.

**711.2 Materials.** Smoke partitions shall be constructed of noncombustible materials. Glazing may be used provided it is heat-strengthened or tempered glazing complying and

shall otherwise comply with Chapter 24, and shall be protected by sprinkler heads installed in a maximum of 6 feet (1829 mm) on center on each side of the smoke partition. NYC  
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**711.3 Fire-resistance rating.** Unless required elsewhere in the code, smoke partitions are not required to have a fire-resistance rating.

**711.4 Continuity.** Smoke partitions shall extend from the top of the foundation or floor below to the underside of the floor or roof sheathing, deck, or slab above or to the underside of the ceiling above where the ceiling membrane is constructed to limit the transfer of smoke.

**711.5 Openings.** Windows shall be sealed to resist the free passage of smoke or be automatic-closing upon detection of smoke. Doors in smoke partitions shall comply with this section.

**711.5.1 Louvers.** Doors in smoke partitions shall not include louvers.

**711.5.2 Smoke and draft-control doors.** Where required elsewhere in the code, doors in smoke partitions shall meet the requirements for a smoke and draft control door assembly tested in accordance with UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot (0.015424 m<sup>3</sup>/s m<sup>2</sup>) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature test and the elevated temperature exposure test. Installation of smoke doors shall be in accordance with NFPA 105.

**711.5.3 Self-closing or automatic-closing doors.** Where required elsewhere in the code, doors in smoke partitions shall be self-closing or automatic-closing by smoke detection in accordance with Section 715.4.8.3.

**711.6 Penetrations and joints.** The space around penetrating items and in joints shall be filled with an approved material to limit the free passage of smoke.

**711.7 Ducts and air transfer openings.** The space around a duct penetrating a smoke partition shall be filled with an approved material to limit the free passage of smoke. Air transfer openings in smoke partitions shall be provided with a smoke damper complying with Section 716.3.2. NYC

**Exception:** Where the installation of a smoke damper will interfere with the operation of a required smoke control system in accordance with Section 909, approved alternative protection shall be utilized.

## SECTION BC 712 HORIZONTAL ASSEMBLIES

**712.1 General.** Floor and roof assemblies required to have a fire-resistance rating shall comply with this section. NYC

**712.2 Materials.** The floor and roof assemblies shall be of materials permitted by the building type of construction.

**Exception:** Horizontal floor or roof assemblies shall be of noncombustible materials when such assemblies serve as a horizontal offset to a fire wall or fire barrier that is required to be noncombustible. NYC  
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**712.3 Fire-resistance rating.** The fire-resistance rating of floor and roof assemblies shall not be less than that required by the building type of construction. Where the floor assembly separates mixed occupancies, the assembly shall have a fire-resistance rating of not less than that required by Section 508.4 based on the occupancies being separated. Where the floor assembly separates a single occupancy into different fire areas, the assembly shall have a fire-resistance rating of not less than that required by Section 707.3.9. Horizontal assemblies separating dwelling units in Group I-1 or R occupancies shall be a minimum of 1-hour fire-resistance-rated construction.

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**712.3.1 Ceiling panels.** Where the weight of lay-in ceiling panels, used as part of fire-resistance-rated floor/ceiling or roof/ceiling assemblies, is not adequate to resist an upward force of 1 pound per square foot (48 Pa), wire or other approved devices shall be installed above the panels to prevent vertical displacement under such upward force.

**712.3.2 Access doors.** Access doors shall be permitted in ceilings of fire-resistance-rated floor/ceiling and roof/ceiling assemblies provided such doors are tested in accordance with ASTM E 119 or UL 263 as horizontal assemblies and labeled by an approved agency for such purpose.

**712.3.3 Unusable space.** In 1-hour fire-resistance-rated floor assemblies, the ceiling membrane is not required to be installed over unusable crawl spaces not intended for occupancy or storage, less than 24 inches (610 mm) in height. In 1-hour fire-resistance-rated roof assemblies, the floor membrane is not required to be installed where the unusable attic space above is not intended for occupancy or storage.

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**712.4 Continuity.** Assemblies shall be continuous without openings, penetrations or joints except as permitted by this section and Sections 708.2, 713.4, 714, and 1022.1. Skylights and other penetrations through a fire-resistance-rated roof deck or slab are permitted to be unprotected, provided that the structural integrity of the fire-resistance-rated roof assemblies is maintained. Unprotected skylights shall not be permitted in roof construction required to be fire-resistance rated in accordance with Section 705.8.6. The supporting construction shall be protected to afford the required fire-resistance rating of the horizontal assembly supported.

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**Exception:** In buildings of Type IIB, IIIB, or VB construction, the construction supporting the horizontal assembly is not required to be fire-resistance-rated at the following:

1. Horizontal assemblies at the separations of incidental uses as specified by Table 509, provided the required fire-resistance rating does not exceed 1 hour.
2. Horizontal assemblies at the separations of dwelling units and sleeping units as required by Section 420.3.
3. Horizontal assemblies at smoke barriers constructed in accordance with Section 710.

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**712.5 Penetrations.** Penetrations of horizontal assemblies shall comply with Section 713.

**712.6 Joints.** Joints made in or between fire-resistance-rated horizontal assemblies shall comply with Section 714. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 714.4.

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**712.7 Ducts and air transfer openings.** Penetrations in horizontal assemblies by ducts and air transfer openings shall comply with Section 716.

**712.8 Floor fire door assemblies.** Floor fire door assemblies used to protect openings in fire-resistance-rated floors shall be tested in accordance with NFPA 288, and shall achieve a fire-resistance rating not less than the assembly being penetrated. Floor fire door assemblies shall be labeled by an approved agency. The label shall be permanently affixed and shall specify the manufacturer, the test standard and the fire-resistance rating.

**712.9 Smoke barrier.** Where horizontal assemblies are required to resist the movement of smoke by other sections of this code in accordance with the definition of smoke barrier, penetrations and joints in such horizontal assemblies shall be protected as required for smoke barriers in accordance with Sections 713.5 and 714.6. Openings through horizontal assemblies shall be protected by shaft enclosures complying with Section 708. Horizontal assemblies shall not be allowed to have unprotected vertical openings.

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## SECTION BC 713 PENETRATIONS

**713.1 Scope.** The provisions of this section shall govern the materials and methods of construction used to protect through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.

**713.1.1 Ducts and air transfer openings.** Penetrations of fire-resistance-rated walls by ducts that are not protected with dampers shall comply with Sections 713.2 through 713.3.3. Penetrations of horizontal assemblies not protected with a shaft as permitted by Exception 4 of Section 708.2, and not required to be protected with fire dampers by other sections of this code, shall comply with Sections 713.4 through 713.4.2.2. Ducts and air transfer openings that are protected with dampers shall comply with Section 716.

**713.1.2 Special inspection.** All through-penetration and membrane-penetration firestop systems shall comply with the special inspection requirements of Chapter 17.

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**713.2 Installation details.** Where sleeves are used, they shall be securely fastened to the assembly penetrated. The space between the item contained in the sleeve and the sleeve itself and any space between the sleeve and the assembly penetrated shall be protected in accordance with this section. Insulation and coverings on or in the penetrating item shall not penetrate the assembly unless the specific material used has been tested as part of the assembly in accordance with this section.



**713.3 Fire-resistance-rated walls.** Penetrations into or through fire walls, fire barriers, smoke barrier walls, and fire partitions shall comply with Sections 713.3.1 through 713.3.3. Penetrations in smoke barrier walls shall also comply with Section 713.5.

**713.3.1 Through penetrations.** Through penetrations of fire-resistance-rated walls shall comply with Section 713.3.1.1 or 713.3.1.2.

**Exception:** Where the penetrating items are steel, ferrous or copper pipes, tubes or conduits, the annular space between the penetrating item and the fire-resistance-rated wall is permitted to be protected as follows:

1. In concrete or masonry walls where the penetrating item is a maximum 6-inch (152 mm) nominal diameter and the area of the opening through the wall does not exceed 144 square inches (0.0929 m<sup>2</sup>), concrete, grout or mortar is permitted where installed the full thickness of the wall or the thickness required to maintain the fire-resistance rating; or
2. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

**713.3.1.1 Fire-resistance-rated assemblies.** Penetrations shall be installed as tested in an approved fire-resistance-rated assembly.

**713.3.1.2 Through-penetration firestop system.** Through penetrations shall be protected by an approved penetration fire stop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water and shall have an F rating of not less than the required fire-resistance rating of the wall penetrated.

**713.3.2 Membrane penetrations.** Membrane penetrations shall be protected by a membrane penetration firestop installed in accordance with Section 713.3.1. Where walls or partitions are required to have a minimum 1-hour fire-resistance rating, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

**Exceptions:**

1. Membrane penetrations of maximum 2-hour fire-resistance-rated walls and partitions by steel electrical boxes that do not exceed 16 square inches (0.0103 m<sup>2</sup>) in area provided the aggregate area of the openings does not exceed 100 square inches (0.0645 m<sup>2</sup>) for any 100 square feet (9.29 m<sup>2</sup>) in wall area.‡ The annular space between the

wall membrane and the box shall not exceed 1/8 inch (3.1 mm). Such boxes on opposite sides of the wall or partitions shall be separated by one of the following: NYC

- 1.1. By a horizontal distance of not less than 24 inches (610 mm) where the wall or partition is constructed with individual noncommunicating stud cavities;
- 1.2. By a horizontal distance of not less than the depth of the wall cavity where the wall cavity is filled with cellulose loose fill, rock wool or slag mineral wool insulation;
- 1.3. By solid fireblocking in accordance with Section 717.2.1;
- 1.4. By protecting both outlet boxes with listed putty pads; or
- 1.5. By other listed materials and methods.
2. Membrane penetrations by listed electrical boxes of any material provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the wall membrane and the box shall not exceed 1/8 inch (3.1 mm) unless listed otherwise. Such boxes on opposite sides of the wall or partition shall be separated by one of the following:
  - 2.1. By the horizontal distance specified in the listing of the electrical boxes;
  - 2.2. By solid fireblocking in accordance with Section 717.2.1;
  - 2.3. By protecting both boxes with listed putty pads; or
  - 2.4. By other listed materials and methods.
3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of a wall opening protective material system for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing.
4. Membrane penetrations by boxes other than electrical boxes, provided such penetrating items and the annular space between the wall membrane and the box, are protected by an approved membrane penetration firestop system installed as tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water, and shall have an F and T rating of not less than the required fire-resistance rating of the wall penetrated and be installed in accordance with their listing.
5. The annular space created by the penetration of an automatic sprinkler, provided it is covered by a metal escutcheon plate.

**713.3.3 Dissimilar materials.** Noncombustible penetrating items shall not connect to combustible items beyond the point of fire stopping unless it can be demonstrated to the commissioner that the fire-resistance integrity of the wall is maintained.

**713.4 Horizontal assemblies.** Penetrations of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly not required to be enclosed in a shaft by Section 708.2 shall be protected in accordance with Sections 713.4.1 through 713.4.2.2.

**713.4.1 Fire-resistance-rated assemblies.** Penetrations of the fire-resistance-rated floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall comply with Sections 713.4.1.1 through 713.4.1.4. Penetrations in horizontal smoke barriers shall also comply with Section 713.5.

**713.4.1.1 Through penetrations.** Through penetrations of fire-resistance-rated horizontal assemblies shall comply with Section 713.4.1.1.1 or 713.4.1.1.2.

**Exceptions:**

1. Penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete, or masonry items through a single fire-resistance-rated floor assembly where the annular space is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated. Penetrating items with a maximum 6-inch (152 mm) nominal diameter shall not be limited to the penetration of a single fire-resistance-rated floor assembly provided the aggregate area of the penetration does not exceed 144 square inches (92 900 mm<sup>2</sup>) in any 100 square feet (9.3 m<sup>2</sup>) of floor area.
2. Penetrations in a single concrete floor by steel, ferrous or copper conduits, pipes, tubes or vents with a maximum 6-inch (152 mm) nominal diameter provided concrete, grout or mortar is installed the full thickness of the floor or the thickness required to maintain the fire-resistance rating. The penetrating items shall not be limited to the penetration of a single concrete floor provided that the area of the opening through each floor does not exceed 144 square inches (92 900 mm<sup>2</sup>).
3. Penetrations by listed electrical boxes of any material provided such boxes have been tested for use in fire-resistance-rated assemblies and installed in accordance with the instructions included in the listing.

**713.4.1.1.1 Installation.** Through penetrations shall be installed as tested in the approved fire-resistance-rated assembly.

**713.4.1.1.2 Through-penetration firestop system.** Through penetrations shall be protected by an approved through-penetration fire stop system installed and tested in accordance with ASTM E 814 or UL 1479, with a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water. The system shall have an F rating and a T rating of not less than 1 hour but not less than the required rating of the floor penetrated.

**Exception:** Floor penetrations contained and located within the cavity of a wall do not require a T rating.

**713.4.1.2 Membrane penetrations.** Penetrations of membranes that are part of a fire-resistance-rated horizontal assembly shall comply with Section 713.4.1.1.1 or 713.4.1.1.2. Where floor/ceiling assemblies are required to have a fire-resistance rating, recessed fixtures shall be installed such that the required fire resistance will not be reduced.

**Exceptions:**

1. Membrane penetrations by steel, ferrous or copper conduits, pipes, tubes or vents or concrete, or masonry items where the annular space is protected either in accordance with Section 713.4.1.1 or to prevent the free passage of flame and the products of combustion. The aggregate area of the openings through the membrane shall not exceed 100 square inches (64 500 mm<sup>2</sup>) in any 100 square feet (9.3 m<sup>2</sup>) of ceiling area in assemblies tested without penetrations.
2. Ceiling membrane penetrations of maximum 2-hour horizontal assemblies by steel electrical boxes that do not exceed 16 square inches (10 323 mm<sup>2</sup>) in area, provided the aggregate area of such penetrations does not exceed 100 square inches (44 500 mm<sup>2</sup>) in any 100 square feet (9.29 m<sup>2</sup>) of ceiling area, and the annular space between the ceiling membrane and the box does not exceed  $\frac{1}{8}$  inch (3.2 mm).
3. Membrane penetrations by electrical boxes of any size or type, which have been listed as part of an opening protective material system for use in horizontal assemblies and are installed in accordance with the instructions included in the listing.
4. Membrane penetrations by listed electrical boxes of any material provided such boxes have been tested for use in fire-resistance-rated assemblies and are installed in accordance with the instructions included in the listing. The annular space between the ceiling

membrane and the box shall not exceed  $\frac{1}{8}$  inch (3.2 mm) unless listed otherwise.

5. The annular space created by the penetration of a fire sprinkler provided it is covered by a metal escutcheon plate.

**713.4.1.3 Ducts and air transfer openings.** Penetrations of horizontal assemblies by ducts and air transfer openings shall comply with Section 716.

**713.4.2† Nonfire-resistance-rated assemblies.** Penetrations of nonfire-resistance-rated floor or floor/ceiling assemblies or the ceiling membrane of a nonfire-resistance-rated roof/ceiling assembly shall meet the requirements of Section 708 or shall comply with Sections 713.4.2.1 through 713.4.2.2.

**713.4.2.1 Noncombustible penetrating items.** Noncombustible penetrating items that connect not more than three stories are permitted provided that the annular space is filled with an approved noncombustible material or with a fill, void or cavity material that is tested and classified for use in through-penetration fire-stop systems.

**713.4.2.2 Penetrating items.** Penetrating items that connect not more than two stories are permitted provided that the annular space is filled with an approved material to resist the free passage of flame and the products of combustion.

**713.5 Penetrations in smoke barriers.** Penetrations in smoke barriers shall be tested in accordance with the requirements of UL 1479 for air leakage. The air leakage rate of the penetration assemblies measured at 0.30 inch (7.47 Pa) of water in both the ambient temperature and elevated temperature tests, shall not exceed:

1. 5.0 cfm per square foot ( $0.025 \text{ m}^3/\text{s m}^2$ ) of penetration opening for each through-penetration firestop system; or
2. A total cumulative leakage of 50 cfm ( $0.024 \text{ m}^3/\text{s}$ ) for any 100 square feet ( $9.3 \text{ m}^2$ ) of wall area, or floor area.

## SECTION BC 714 FIRE-RESISTANT JOINT SYSTEMS

**714.1 General.** Joints installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed. Fire-resistant joint systems shall be tested in accordance with Section 714.3. The void created at the intersection of a floor/ceiling assembly and an exterior curtain wall assembly shall be protected in accordance with Section 714.4.

**Exception:** Fire-resistant joint systems shall not be required for joints in all of the following locations:

1. Floors within a single dwelling unit.

2. Floors where the joint is protected by a shaft enclosure in accordance with Section 708†.

3. Floors within atriums where the space adjacent to the atrium is included in the volume of the atrium for smoke control purposes.

4. Floors within malls where a tenant space is separated from the mall.

5. Floors and ramps within open and enclosed parking garages or structures constructed in accordance with Sections 406.3 and 406.4, respectively.

6. Mezzanine floors.

7. Walls that are permitted to have unprotected openings.

8. Roofs where openings are permitted.

9. Control joints not exceeding a maximum width of 0.625 inch (15.9 mm) and tested in accordance with ASTM E 119 or UL 263.

**714.2 Installation.** Fire-resistant joint systems shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to accommodate expected building movements and to resist the passage of fire and hot gases.

**714.3 Fire test criteria.** Fire-resistant joint systems shall be tested in accordance with the requirements of either ASTM E 1966 or UL 2079. Nonsymmetrical wall joint systems shall be tested with both faces exposed to the furnace, and the assigned fire-resistance rating shall be the shortest duration obtained from the two tests. When evidence is furnished to show that the wall was tested with the least fire-resistant side exposed to the furnace, subject to acceptance of the commissioner, the wall need not be subjected to tests from the opposite side.

**Exception:** For exterior walls with a horizontal fire separation distance greater than 5 feet (1524 mm), the joint system shall be required to be tested for interior fire exposure only.

**714.4 Exterior curtain wall/floor intersection.** Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to prevent the passage of flame for the time period at least equal to the fire-resistance rating of the floor assembly and prevent the passage of heat and hot gases sufficient to ignite cotton waste. Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5.

**714.5 Spandrel wall.** Height and fire-resistance requirements for curtain wall spandrels shall comply with Section 705.8.5. Where Section 705.8.5 does not require a fire-resistance-rated spandrel wall, the requirements of Section 714.4 shall still apply to the intersection between the spandrel wall and the floor.

**714.6 Fire-resistant joint systems in smoke barriers.** Fire-resistant joint systems in smoke barriers, and joints at the

intersection of a horizontal smoke barrier and an exterior curtain wall, shall be tested in accordance with the requirements of UL 2079 for air leakage. The air leakage rate of the joint shall not exceed 5 cfm per lineal foot (0.00775 m<sup>3</sup>/s m) of joint at 0.30 inch (7.47 Pa) of water for both the ambient temperature and elevated temperature tests.‡

## SECTION BC 715 OPENING PROTECTIVES

**715.1 General.** Opening protectives required by other sections of this code shall comply with the provisions of this section.

**715.2 Fire-resistance-rated glazing.** Fire-resistance-rated glazing tested as part of a fire-resistance-rated wall assembly in accordance with ASTM E 119 or UL 263 and labeled in accordance with Section 703.5 shall be permitted in fire doors and fire window assemblies in accordance with their listings and shall not otherwise be required to comply with this section.

**715.3 Alternative methods for determining fire protection ratings.** The application of any of the alternative methods listed in this section shall be based on the fire exposure and acceptance criteria specified in NFPA 252, NFPA 257 or UL 9. The required fire resistance of an opening protective shall be permitted to be established by any of the following methods or procedures:

1. Designs documented in approved sources.
2. Calculations performed in an approved manner.
3. Engineering analysis based on a comparison of opening protective designs having fire protection ratings as determined by the test procedures set forth in NFPA 252, NFPA 257 or UL 9.
4. Alternative protection methods as allowed by Section 28-113.2 of the *Administrative Code*.

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**715.4 Fire door and shutter assemblies.** Approved fire door and fire shutter assemblies shall be constructed of any material or assembly of component materials that conforms to the test requirements of Section 715.4.1, 715.4.2 or 715.4.3 and the fire protection rating indicated in Table 715.4. Fire door frames with transom lights, sidelights or both shall be permitted in accordance with Section 715.4.5. Fire door assemblies and shutters shall be installed in accordance with the provisions of this section and NFPA 80.

### Exceptions:

1. Labeled protective assemblies that conform to the requirements of this section or UL 10A, UL 14B and UL 14C for tin-clad fire door assemblies.
2. Floor fire door assemblies in accordance with Section 712.8.

**715.4.1 Side-hinged or pivoted swinging doors.** Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL 10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016 mm) or less above the sill.

**TABLE 715.4  
FIRE DOOR AND FIRE SHUTTER FIRE PROTECTION RATINGS**

TYPE OF ASSEMBLY	REQUIRED ASSEMBLY RATING (hours)	MINIMUM FIRE DOOR AND FIRE SHUTTER ASSEMBLY RATING (hours)
Fire walls and fire barriers having a required fire-resistance rating greater than 1 hour	4 3 2 1½	3 3 <sup>a</sup> 1½ 1½
Fire barriers having a required fire-resistance rating of 1 hour: Shaft, exit enclosure and exit passageway walls Other fire barriers	1 1	1 ¾
Fire partitions Corridor walls Other partitions	1 1	¾ ¾
Exterior walls	3 2 1	1½ 1½ ¾
Smoke barriers	1	1/3 <sup>b</sup>

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- a. Two doors, each with a fire protection rating of 1½ hours, installed on opposite sides of the same opening in a fire wall, shall be deemed equivalent in fire protection rating to one 3-hour fire door.
- b. For testing requirements, see Section 715.4.3.

**715.4.2 Other types of assemblies.** Fire door assemblies with other types of doors, including swinging elevator doors and fire shutter assemblies, shall be tested in accordance with NFPA 252 or UL 10B. The pressure in the furnace shall be maintained as nearly equal to the atmospheric pressure as possible. Once established, the pressure shall be maintained during the entire test period.

**715.4.3 Door assemblies in corridors and smoke barriers.** Fire door assemblies located in corridor walls or smoke barrier walls having a fire-resistance rating in accordance with Table 715.4 shall be tested in accordance with NFPA 252 or UL 10C.

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### Exceptions:

1. Viewports that require a hole not larger than 1 inch (25 mm) in diameter through the door, have at least an 0.25-inch-thick (6.4 mm) glass disc and the holder is of metal that will not melt out where subject to temperatures of 1,700°F (927°C).
2. Corridor door assemblies in occupancies of Group I-2 shall be in accordance with Section 407.3.1.
3. Horizontal sliding doors in smoke barriers that comply with Sections 408.3 and 408.8.4 in occupancies in Group I-3.

**715.4.3.1 Smoke and draft control.** Fire door assemblies shall also meet the requirements for a smoke and draft control door assembly tested in accordance with



UL 1784. The air leakage rate of the door assembly shall not exceed 3.0 cubic feet per minute per square foot ( $0.01524 \text{ m}^3/\text{s} \cdot \text{m}^2$ ) of door opening at 0.10 inch (24.9 Pa) of water for both the ambient temperature and elevated temperature tests. Louvers shall be prohibited. Installation of smoke doors shall be in accordance with NFPA 105.

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**715.4.3.2 Glazing in door assemblies.** Glazing material in any other part of the door assembly, including transom lights and sidelights, shall be tested in accordance with NFPA 257 or UL 9, including the hose stream test, in accordance with Section 715.5.

**715.4.4 Doors in exit enclosures and exit passageways.** Fire door assemblies in exit enclosures and exit passageways shall have a maximum transmitted temperature end point of not more than 450°F (232°C) above ambient at the end of 30 minutes of standard fire test exposure.

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**Exception:** The maximum transmitted temperature is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

**715.4.4.1 Glazing in doors.** Fire-protection-rated glazing in excess of 100 square inches ( $0.065 \text{ m}^2$ ) shall be permitted in fire door assemblies when tested as components of the door assemblies and not as glass lights, and shall have a maximum transmitted temperature rise of 450°F (232°C) in accordance with Section 715.4.4.

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**Exception:** The maximum transmitted temperature rise is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

**715.4.5 Fire door frames with transom lights and sidelights.** Door frames with transom lights, sidelights, or both, shall be permitted where a  $\frac{3}{4}$ -hour fire-protection rating or less is required in accordance with Table 715.4. Where a fire-protection rating exceeding  $\frac{3}{4}$ -hour is required in accordance with Table 715.4, fire door frames with transom lights, sidelights, or both, shall be permitted where installed with fire-resistance-rated glazing tested as an assembly in accordance with ASTM E 119 or UL 263.

**715.4.6 Labeled protective assemblies.** Fire door assemblies shall be labeled by an approved agency. The labels shall comply with NFPA 80, and shall be permanently affixed to the door or frame.

**715.4.6.1 Fire door labeling requirements.** Fire doors shall be labeled showing the name of the manufacturer or other identification readily traceable back to the manufacturer, the name or trademark of the third-party inspection agency, the fire protection rating and, where required for fire doors in exit enclosures and exit passageways by Section 715.4.4, the maximum transmitted temperature end point. Smoke and draft control doors complying with UL 1784 shall be labeled as such and shall also comply with Section 715.4.6.3. Labels shall be approved and permanently affixed. The label shall be applied at the factory or location where fabrication and assembly are performed.

**715.4.6.2 Oversized doors.** Oversized fire doors shall bear an oversized fire door label by an approved agency or shall be provided with a certificate of inspection furnished by an approved testing agency. When a certificate of inspection is furnished by an approved testing agency, the certificate shall state that the door conforms to the requirements of design, materials and construction, but has not been subjected to the fire test.

**715.4.6.3 Smoke and draft control door labeling requirements.** Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with Section 715.4.6.1 and shall show the letter “S” on the fire rating label of the door. This marking shall indicate that the door and frame assembly are in compliance when listed or labeled gasketing is also installed.

**715.4.6.4 Fire door frame labeling requirements.** Fire door frames shall be labeled showing the names of the manufacturer and the third-party inspection agency.

**715.4.7 Glazing material.** Fire-protection-rated glazing conforming to the opening protection requirements in Section 715.4 shall be permitted in fire door assemblies.

**715.4.7.1 Size limitations.** Fire-protection-rated glazing used in fire doors shall comply with the size limitations of NFPA 80.

**Exceptions:**

1. Fire-protection-rated glazing in fire doors located in fire walls shall be prohibited except that where serving in a fire door in a horizontal exit, a self-closing swinging door shall be permitted to have a vision panel of not more than 100 square inches ( $0.065 \text{ m}^2$ ) without a dimension exceeding 10 inches (254 mm).
2. Fire-protection-rated glazing shall not be installed in fire doors having a  $1\frac{1}{2}$ -hour fire protection rating intended for installation in fire barriers, unless the glazing is not more than 100 square inches ( $0.065 \text{ m}^2$ ) in area.

**715.4.7.2 Exit and elevator protectives.** Approved fire-protection-rated glazing used in fire door assemblies in elevator and exit enclosures shall be so located as to furnish clear vision of the passageway or approach to the elevator, ramp or stairway.

**715.4.7.3 Labeling.** Fire-protection-rated glazing shall bear a label or other identification showing the name of the manufacturer, the test standard and information required in Section 715.5.9.1 that shall be issued by an approved agency and shall be permanently affixed to the glazing.

**715.4.7.3.1 Identification.** For fire protection-rated glazing, the label shall bear the following four-part identification: “D, H or NH, T or NT, XXX.” “D” indicates that the glazing shall be used in fire door assemblies and that the glazing meets the fire protection requirements of NFPA 252. “H” shall indicate that the glazing meets the hose stream

requirements of NFPA 252. "NH" shall indicate that the glazing does not meet the hose stream requirements of the test. "T" shall indicate that the glazing meets the temperature requirements of Section 715.4.4.1. "NT" shall indicate that the glazing does not meet the temperature requirements of Section 715.4.4.1. The placeholder "XXX" shall specify the fire-protection-rating period, in minutes.

**715.4.7.4 Safety glazing.** Fire-protection-rated glazing installed in fire doors in areas subject to human impact in hazardous locations shall comply with Chapter 24.

**NYC 715.4.8 Door closing.** Fire doors shall be self-closing or automatic-closing in accordance with this section.

**Exceptions:**

1. Fire doors located in common walls separating sleeping units in Group R- 1 shall be permitted without automatic- or self-closing devices.
2. The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I emergency recall operation.

**715.4.8.1 Latch required.** Unless otherwise specifically permitted, single fire doors and both leaves of pairs of side-hinged swinging fire doors shall be provided with an active latch bolt that will secure the door when it is closed.

**715.4.8.2 Automatic-closing fire door assemblies.** Automatic-closing fire door assemblies shall be self-closing in accordance with NFPA 80.

**NYC 715.4.8.3 Smoke-activated doors.** Automatic-closing fire doors installed in the following locations shall be automatic-closing by the actuation of smoke detectors installed in accordance with Section 907.3 or by loss of power to the smoke detector or hold-open device. Doors that are automatic-closing by smoke detection shall not have more than a 10-second delay before the door starts to close after the smoke detector is actuated.

1. Doors installed across a corridor.
2. Doors that protect openings in exits or corridors required to be of fire-resistance-rated construction.
3. Doors that protect openings in walls that are capable of resisting the passage of smoke in accordance with Section 509.4.
4. Doors installed in smoke barriers in accordance with Section 710.5.
5. Doors installed in fire partitions in accordance with Section 709.6.
6. Doors installed in a fire wall in accordance with Section 706.8.
7. Doors installed in shaft enclosures in accordance with Section 708.7.

8. Doors installed in refuse and laundry chutes and access and termination rooms in accordance with Section 708.13.

9. Doors installed in the walls for compartmentation of underground buildings in accordance with Section 405.4.2.

10. Doors installed in the elevator lobby walls of underground buildings in accordance with Section 405.4.3.

11. Doors installed in smoke partitions in accordance with Section 711.5.3.

12. Doors serving vertical exit enclosure in accordance with the exception to Section 708.7.

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**715.4.8.4 Doors in pedestrian ways.** Vertical sliding or vertical rolling steel fire doors in openings through which pedestrian's travel shall be heat activated or activated by smoke detectors with alarm verification.

**715.4.9 Swinging fire shutters.** Where fire shutters of the swinging type are installed in exterior openings, not less than one row in every three vertical rows shall be arranged to be readily opened from the outside, and shall be identified by distinguishing marks or letters not less than 6 inches (152 mm) high.

**715.4.10 Rolling fire shutters.** Where fire shutters of the rolling type are installed, such shutters shall include approved automatic-closing devices.

**715.5 Fire-protection rated glazing.** Glazing in fire window assemblies shall be fire protection rated in accordance with this section and Table 715.5. Glazing in fire door assemblies shall comply with Section 715.4.7. Fire-protection-rated glazing shall be tested in accordance with and shall meet the acceptance criteria of NFPA 257 or UL 9. Fire-protection-rated glazing shall also comply with NFPA 80. Openings in nonfire-resistance-rated exterior wall assemblies that require protection in accordance with Section 705.3, 705.8, 705.8.5 or 705.8.6 shall have a fire-protection rating of not less than  $\frac{3}{4}$  hour.

**Exception:** Wired glass in accordance with Section 715.5.4. **NYC**

**715.5.1 Testing under positive pressure.** NFPA 257 or UL 9 $\frac{1}{2}$  shall evaluate fire-protection-rated glazing under positive pressure. Within the first 10 minutes of a test, the pressure in the furnace shall be adjusted so at least two-thirds of the test specimen is above the neutral pressure plane, and the neutral pressure plane shall be maintained at that height for the balance of the test.

**715.5.2 Nonsymmetrical glazing systems.** Nonsymmetrical fire-protection-rated glazing systems in fire partitions, fire barriers or in exterior walls with a fire separation of 5 feet (1524 mm) or less pursuant to Section 705 $\frac{1}{2}$  shall be tested with both faces exposed to the furnace, and the assigned fire protection rating shall be the shortest duration obtained from the two tests conducted in compliance with NFPA 257 or UL 9. **NYC**

**TABLE 715.5**  
**FIRE WINDOW ASSEMBLY FIRE PROTECTION RATINGS**

TYPE OF ASSEMBLY		REQUIRED ASSEMBLY RATING (hours)	MINIMUM FIRE WINDOW ASSEMBLY RATING (hours)
NYC Interior walls:	Fire walls	All	NP <sup>a</sup>
	Fire barriers	> 1 1	NP <sup>a</sup> $\frac{3}{4}$
	Smoke barriers	1	$\frac{3}{4}$
	Fire partitions		$\frac{3}{4}$
NYC Exterior walls		>1 1	1 $\frac{1}{2}$ $\frac{3}{4}$
	Party walls	All	NP <sup>a</sup>

a. Not permitted except as specified in Section 715.2.

**715.5.3 Safety glazing.** Fire-protection-rated glazing installed in fire window assemblies in areas subject to human impact in hazardous locations shall comply with Chapter 24.

**715.5.4 Wired glass.** Steel window frame assemblies of 0.125-inch (3.2 mm) minimum solid section or of not less than nominal 0.048-inch-thick (1.2 mm) formed sheet steel members fabricated by pressing, mitering, riveting, interlocking or welding and having provision for glazing with  $\frac{1}{4}$ -inch (6.4 mm) wired glass where securely installed in the building construction and glazed with  $\frac{1}{4}$ -inch (6.4 mm) labeled wired glass shall be deemed to meet the requirements for a  $\frac{3}{4}$ -hour fire window assembly. Wired glass panels shall conform to the size limitations set forth in Table 715.5.4.

**TABLE 715.5.4**  
**FIRE DOOR AND FIRE SHUTTER FIRE PROTECTION RATINGS**

OPENING FIRE PROTECTION RATING	MAXIMUM AREA (square inches)	MAXIMUM HEIGHT (inches)	MAXIMUM WIDTH (inches)
3 hours	0	0	0
1 $\frac{1}{2}$ -hour doors in exterior walls	0	0	0
1 and 1 $\frac{1}{2}$ hours	100	33	10
$\frac{3}{4}$ hour	1,296	54	54
Fire window assemblies	1,296	54	54

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm<sup>2</sup>.

**715.5.5 Nonwired glass.** Glazing other than wired glass in fire window assemblies shall be fire-protection-rated glazing installed in accordance with and complying with the size limitations set forth in NFPA 80.

**715.5.6 Installation.** Fire-protection-rated glazing shall be in the fixed position or be automatic-closing and shall be installed in approved frames.

**715.5.7 Window mullions.** Metal mullions that exceed a nominal height of 12 feet (3658 mm) shall be protected with materials to afford the same fire-resistance rating as required for the wall construction in which the protective is located.

**715.5.8 Interior fire window assemblies.** Fire-protection-rated glazing used in fire window assemblies located in fire partitions and fire barriers shall be limited to use in assemblies with a maximum fire-resistance rating of 1 hour in accordance with this section.

**715.5.8.1 Where  $\frac{3}{4}$ -hour fire protection window assemblies permitted.** Fire-protection-rated glazing requiring 45-minute opening protection in accordance with Table 715.5 shall be limited to fire partitions designed in accordance with Section 709 and fire barriers utilized in the applications set forth in Sections 707.3.6 and 707.3.8 where the fire-resistance rating does not exceed 1 hour.

**715.5.8.2 Size limitations.** The total area of windows shall not exceed 25 percent of the area of a common wall with any room.

**715.5.9 Labeling requirements.** Fire-protection-rated glazing shall bear a label or other identification showing the name of the manufacturer, the test standard, and information required in Section 715.5.9.1 that shall be issued by an approved agency and shall be permanently affixed to the glazing.

**715.5.9.1 Identification.** For fire-protection-rated glazing, the label shall bear the following two-part identification: "OH – XXX." "OH" indicates that the glazing meets both the fire protection and the hose-stream requirements of NFPA 257 or UL 9 and is permitted to be used in openings. "XXX" represents the fire-protection rating period, in minutes, that was tested.

## SECTION BC 716 DUCTS AND AIR TRANSFER OPENINGS

**716.1 General.** The provisions of this section shall govern the protection of duct penetrations and air transfer openings in assemblies required to be protected.

**716.1.1 Ducts that penetrate fire-resistance-rated assemblies without dampers.** Ducts that penetrate fire-resistance-rated assemblies and are not required by this section to have dampers shall comply with the requirements of Sections 713.2 through 713.3.3. Ducts that pene-

trate horizontal assemblies not required to be contained within a shaft and not required by this section to have dampers shall comply with the requirements of Section 713.4 through 713.4.2.2.

**716.1.1.1 Ducts that penetrate nonfire-resistance-rated assemblies.** The space around a duct penetrating a nonfire-resistance-rated floor assembly shall comply with Section 716.6.3.

**716.2 Installation.** Fire dampers, smoke dampers, combination fire/smoke dampers and ceiling radiation dampers located within air distribution and smoke control systems shall be installed in accordance with the requirements of this section, the *New York City Mechanical Code*, the manufacturer's installation instructions and damper's listing.

**716.2.1 Smoke control system.** Where the installation of a fire damper will interfere with the operation of a required smoke control system in accordance with Section 909, approved alternative protection shall be utilized. Where mechanical systems including ducts and dampers utilized for normal building ventilation serve as part of the smoke control system, the expected performance of these systems in smoke control mode shall be addressed in the rational analysis required by Section 909.4.

**716.2.1.1 Remote control.** Provisions for operation by remote control of combination fire/smoke dampers shall be in accordance with Section 607.2.1.1 of the *New York City Mechanical Code*.

**716.2.2 Hazardous exhaust ducts.** Fire dampers for hazardous exhaust duct systems shall comply with the *New York City Mechanical Code*.

**716.2.3 Supply air systems.** Smoke dampers in supply airhandling systems having a capacity equal to or greater than 15,000 cfm (7.1 m<sup>3</sup>/s) shall be installed in accordance with Section 607.2.3 of the *New York City Mechanical Code*.

**716.3 Damper testing, ratings and actuation.** Damper testing ratings and actuation shall be in accordance with Sections 716.3.1 through 716.3.3.

**716.3.1 Damper testing.** Dampers shall be listed and bear the label of an approved testing agency indicating compliance with the standards in this section. Fire dampers shall comply with the requirements of UL 555. Only fire dampers labeled for use in dynamic systems shall be installed in heating, ventilation and air-conditioning systems designed to operate with fans on during a fire. Smoke dampers shall comply with the requirements of UL 555S. Combination fire/smoke dampers shall comply with the requirements of both UL 555 and UL 555S. Ceiling radiation dampers shall comply with the requirements of UL 555C.

**716.3.2 Damper rating.** Damper ratings shall be in accordance with Sections 716.3.2.1 through 716.3.2.3.

**716.3.2.1 Fire damper ratings.** Fire dampers shall have the minimum fire protection rating specified in Table 716.3.2.1 for the type of penetration.

**TABLE 716.3.2.1  
FIRE DAMPER RATING**

TYPE OF PENETRATION	MINIMUM DAMPER RATING (hours)
Less than 3-hour fire-resistance-rated assemblies	1.5
3-hour or greater fire-resistance-rated assemblies	3

**716.3.2.2 Smoke damper ratings.** Smoke damper leakage ratings shall not be less than Class II. Elevated temperature ratings shall not be less than 250°F (121°C).

**716.3.2.3 Combination fire/smoke damper ratings.** Combination fire/smoke dampers shall have the minimum fire protection rating specified for fire dampers in Table 716.3.2.1 for the type of penetration and shall also have a minimum Class II leakage rating and a minimum elevated temperature rating of 250°F (121°C).

**716.3.3 Damper actuation.** Damper actuation shall be in accordance with Sections 716.3.3.1 through 716.3.3.4 as applicable.

**716.3.3.1 Fire damper actuation device.** The fire damper actuation device shall meet one of the following requirements:

1. The operating temperature shall be approximately 50°F (10°C) above the normal temperature within the duct system, but not less than 160°F (71°C).
2. The operating temperature shall be not more than 286°F (141°C) where located in a smoke control system complying with Section 909.

**716.3.3.2 Smoke damper actuation.** The smoke damper shall close upon actuation of a listed smoke detector or detectors installed in accordance with Section 907.3 and one of the following methods, as applicable:

1. Where a smoke damper is installed within a duct, a smoke detector shall be installed in the duct within 5 feet (1524 mm) of the damper with no air outlets or inlets between the detector and the damper. The detector shall be listed for the air velocity, temperature and humidity anticipated at the point where it is installed. Other than in mechanical smoke control systems, dampers shall be closed upon fan shutdown where local smoke detectors require a minimum velocity to operate.

**Exceptions:‡**

1. Duct smoke detectors will not be required at each fire smoke damper provided the supply fan shall shut down and all the fire smoke dampers associated with the supply system automatically close upon actuation



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of any automatic alarm initiating device on the floor(s).‡

2. Duct smoke detectors will be required within 5 feet (1.5 m) downstream of any electric duct reheat coil.‡
3. Non-ducted return air systems shall have a smoke detector located within 5 feet (1.5 m) upstream of each return air protected opening in a 2-hour fire-rated barrier.‡
4. Ducted return air systems shall have a duct smoke detector located within 5 feet (1.5 m) of a smoke damper; additional smoke detectors will not be required at fire smoke dampers located downstream where there are no additional return air inlets.‡

2. Where a smoke damper is installed above smoke barrier doors in a smoke barrier, a spot-type detector listed for releasing service shall be installed on either side of the smoke barrier door opening.

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3. Where a smoke damper is installed within an unducted opening in a wall, a spot-type detector listed for releasing service shall be installed within 5 feet (1524 mm) horizontally of the damper.

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4. Where a smoke damper is installed in a corridor wall, the damper shall be permitted to be controlled by a smoke detection system installed in the corridor.

5. Where a total-coverage smoke detector system is provided within areas served by a heating, ventilation and air-conditioning (HVAC) system, smoke dampers shall be permitted to be controlled by the smoke detection system.

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6. Smoke dampers that are part of an engineered smoke control system shall be controlled in accordance with Section 607.3.3.2 of the *New York City Mechanical Code*.

**716.3.3.3 Combination fire/smoke damper actuation.** Combination fire/smoke damper actuation shall be in accordance with Sections 716.3.3.1 and 716.3.3.2. Combination fire/smoke dampers installed in smoke control system shaft penetrations shall not be activated by local area smoke detection unless it is secondary to the smoke management system controls.

**716.3.3.4 Ceiling radiation damper actuation.** The operating temperature of a ceiling radiation damper actuation device shall be 50°F (27.8°C) above the normal temperature within the duct system, but not less than 160°F (71°C).

**716.4 Access and identification.** Fire and smoke dampers shall be provided with an approved means of access, which is large enough to permit inspection and maintenance of the damper and its operating parts. The access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the

assembly. Access points shall be permanently identified on the exterior by a label having letters not less than 1/2 inch (12.7 mm) in height reading: FIRE/SMOKE DAMPER, SMOKE DAMPER or FIRE DAMPER followed by an identification marking that is individual and unique to the damper accessed.

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**716.5 Where required.** Fire dampers, smoke dampers, and combination fire/smoke dampers shall be provided as specified in this section. Where an assembly is required to have both fire dampers and smoke dampers, combination fire/smoke dampers or a fire damper and a smoke damper shall be required.

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**Exception:** Ducts 20 square inches (129 cm<sup>2</sup>) or less passing through fire-resistance-rated assemblies shall not require fire dampers or fire smoke dampers.

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**716.5.1 Fire walls.** Ducts and air transfer openings permitted in fire walls in accordance with Section 706.11 shall be protected with listed fire dampers and smoke dampers installed in accordance with their listing.

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**Exception:** Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

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**716.5.1.1 Horizontal exits.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point that a duct or air transfer opening penetrates a fire wall that serves as a horizontal exit.

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**Exception:** Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

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**716.5.2 Fire barriers.** Ducts and air transfer openings that penetrate fire barriers shall be protected with listed fire dampers installed in accordance with their listing. Ducts and air transfer openings shall not penetrate exit enclosures and exit passageways except as permitted by Sections 1022.4 and 1023.6, respectively. In addition, smoke dampers shall be installed in penetrations of public corridor and horizontal exit walls in accordance Sections 716.5.2.1 and 716.5.2.2.

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**Exception:** Fire dampers are not required at penetrations of fire barriers where any of the following apply:

1. Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the fire-resistance-rated assembly.
2. Ducts are used as part of an engineered smoke control system in accordance with Section 716.2.1 and Section 909 where the use of a fire damper would interfere with the operation of a smoke control system.
3. Such walls are penetrated by ducted HVAC systems, have a required fire-resistance rating of 1 hour or less, are in areas of other than Group H and are in buildings equipped throughout with an

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automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. For the purposes of this exception, a ducted HVAC system shall be a duct system for conveying supply, return or exhaust air as part of the structure's HVAC system. Such a duct system shall be constructed of sheet steel not less than 26 gage thickness and shall be continuous from the air-handling appliance or equipment to the air outlet and inlet terminals.

**716.5.2.1 Horizontal exits.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a fire barrier that serves as a horizontal exit.

**Exception:**† Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

**716.5.2.2 Public corridors.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a public corridor wall constructed as a fire barrier.

**Exceptions:**

1. Smoke dampers are not required where the building is equipped throughout with an engineered smoke control system in accordance with Section 909, and smoke dampers are not necessary for the operation and control of the system.
2. Smoke dampers are not required in corridor penetrations where the duct is constructed of steel not less than 0.019-inch (0.48 mm) in thickness and there are no openings serving the corridor.
3. Smoke dampers are not required in corridor penetrations in Group R-2 buildings and Public Corridors serving R-2 spaces in mixed use buildings.
4. Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

**716.5.3 Shaft enclosures.** Ducts and air transfer openings shall not penetrate a shaft serving as an exit enclosure except as permitted by Section 1022.4. Shaft enclosures that are permitted to be penetrated by ducts and air transfer openings shall be protected with approved fire and smoke dampers installed in accordance with their listing.

**Exceptions:**

1. Fire dampers are not required at penetrations of shafts where:
  - 1.1. Steel exhaust subducts are extended at least 22 inches (559 mm) vertically in exhaust

shafts provided there is a continuous airflow upward to the outside;

- 1.2. Penetrations are tested in accordance with ASTM E 119 or UL 263 as part of the fire-resistance-rated assembly;
- 1.3. Ducts are used as part of an approved smoke control system designed and installed in accordance with Section 909, and where the fire damper will interfere with the operation of the smoke control system; or
- 1.4. The penetrations are in parking garage exhaust or supply shafts that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
2. In Group B and R occupancies equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, smoke dampers are not required at penetrations of shafts where kitchen, bathrom and toilet room exhaust openings with steel exhaust subducts, having a minimum thickness of 0.0187 inch (0.4712 mm) (No. 36 gage), extend at least 22 inches (559 mm) vertically and where the exhaust fan at the upper terminus is powered continuously and maintains airflow upward to the outdoors.
3. Smoke dampers are not required at penetration of exhaust or supply shafts in parking garages that are separated from other building shafts by not less than 2-hour fire-resistance-rated construction.
4. Smoke dampers are not required at penetrations of shafts where ducts are used as part of an engineered mechanical smoke control system designed in accordance with Section 909 and where the smoke damper will interfere with the operation of the smoke control system.
5. Fire dampers and/or smoke dampers are not required at a shaft where the shaft is acting as an extension of the mechanical equipment room that it serves and the shaft and mechanical equipment room maintain fire and smoke separation required by the greater of the two spaces from the occupied portions of the building and meet the requirements of Sections 708.11 and 708.12.
6. Smoke dampers are not required to be located within a prescribed distance of a fire-rated enclosure within which the air handling equipment is located and where isolation smoke dampers are used in air-handling equipment in accordance with Section 607.2.3 of the *New York City Mechanical Code*.
7. Smoke dampers are not required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air during a fire emergency condition.

8. Smoke dampers are not required in exhaust ducts or shafts where the exhaust fan is maintained in operation during occupancy, such as in bathroom and toilet room exhausts.

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**716.5.3.1 Limitations.** Shafts that constitute air ducts shall be limited in accordance with Section 607.5.5.2 of the *New York City Mechanical Code*.

**716.5.4 Fire partitions.** Ducts and air transfer openings that penetrate fire partitions shall be protected with listed fire dampers installed in accordance with their listing.

**Exceptions:** In occupancies other than Group H, fire dampers are not required where any of the following apply:

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1. The partitions are tenant separation and interior corridor walls in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and the duct is protected as a through penetration in accordance with Section 713.

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2. The partitions are tenant partitions in covered mall buildings where the walls are not required by provisions elsewhere in the code to extend to the underside of the floor or roof sheathing, slab or deck above.

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3. The duct system is constructed of approved materials in accordance with the *New York City Mechanical Code* and the duct penetrating the wall complies with all of the following requirements:

3.1. The duct shall not exceed 100 square inches (0.06 m<sup>2</sup>).

3.2. The duct shall be constructed of steel a minimum of 0.0217 inch (0.55 mm) in thickness.

3.3. The duct shall not have openings that communicate the corridor with adjacent spaces or rooms.

3.4. The duct shall be installed above a ceiling.

3.5. The duct shall not terminate at a wall register in the fire-resistance-rated wall.

3.6. A minimum 12-inch-long (305 mm) by 0.060-inch-thick (1.52 mm) steel sleeve shall be centered in each duct opening. The sleeve shall be secured to both sides of the wall and all four sides of the sleeve with minimum 1½-inch by 1½-inch by 0.060-inch (38 mm by 38 mm by 1.52 mm) steel retaining angles. The retaining angles shall be secured to the sleeve and the wall with No. 10 (M5) screws. The annular space between the steel sleeve and the wall opening shall be filled with mineral wool batting or approved equivalent on all sides.

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**716.5.5 Smoke barriers.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a

smoke barrier. Smoke dampers and smoke damper actuation methods shall comply with Section 716.3.3.2.

**Exceptions:**

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1. Smoke dampers are not required where the openings in ducts are limited to a single smoke compartment and the ducts are constructed of steel.

2. Smoke dampers are not required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

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**716.5.6 Exterior walls.** Ducts and air transfer openings in fire-resistance-rated exterior walls required to have protected openings in accordance with Section 705.10 shall be protected with listed fire dampers installed in accordance with their listing.

**716.5.7 Smoke partitions.** A listed smoke damper designed to resist the passage of smoke shall be provided at each point that an air transfer opening penetrates a smoke partition. Smoke dampers and smoke damper actuation methods shall comply with Section 716.3.3.2.

**Exceptions:**

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1. Where the installation of a smoke damper will interfere with the operation of a required smoke control system in accordance with Section 909, approved alternative protection shall be utilized.

2. Smoke dampers shall not be required in ducts where the air continues to move and the air-handling system installed is arranged to prevent recirculation of exhaust or return air under fire emergency conditions.

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**716.6 Horizontal assemblies.** Penetrations by ducts and air transfer openings of a floor, floor/ceiling assembly or the ceiling membrane of a roof/ceiling assembly shall be protected by a shaft enclosure that complies with Section 708 or shall comply with Sections 716.6.1 through 716.6.3.

**716.6.1 Through penetrations.** In occupancies other than Groups I-2 and I-3, a duct and air transfer opening system constructed of approved materials in accordance with the *New York City Mechanical Code* that penetrates a fire-resistance-rated floor/ceiling assembly that connects not more than two stories is permitted without shaft enclosure protection provided a fire damper is installed at the floor line and the penetration is fireblocked in accordance with Section 717.2.5 or the duct is protected in accordance with Section 713.4. For air transfer openings, see Exception 7 to Section 708.2.

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**Exception:** A duct serving a dwelling unit is permitted to penetrate three floors or less without a fire damper at each floor provided such duct meets all of the following requirements.

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1. The duct shall be contained and located within the cavity of a wall and shall be constructed of steel having a minimum wall thickness of 0.187 inches (0.4712 mm) (No. 26 gage).



2. The duct shall open into only one dwelling or sleeping unit and the duct system shall be continuous from the unit to the exterior of the building.

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3. The duct shall not exceed 5-inch (127 mm) nominal diameter and the total area of such ducts shall not exceed 100 square inches (0.065 m<sup>2</sup>) in any 100 square feet (9.3 m<sup>2</sup>) of floor area.

4. The annular space around the duct is protected with materials that prevent the passage of flame and hot gases sufficient to ignite cotton waste where subjected to ASTM E 119 or UL 263 time-temperature conditions under a minimum positive pressure differential of 0.01 inch (2.49 Pa) of water at the location of the penetration for the time period equivalent to the fire-resistance rating of the construction penetrated.

5. Grille openings located in a ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with a listed ceiling radiation damper installed in accordance with Section 716.6.2.

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**716.6.2 Membrane penetrations.** Ducts and air transfer openings constructed of approved materials in accordance with the *New York City Mechanical Code* that penetrate the ceiling membrane of a fire-resistance-rated floor/ceiling or roof/ceiling assembly shall be protected with one of the following:

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1. A shaft enclosure in accordance with Section 708.
2. A listed ceiling radiation damper and firestopping is installed at the ceiling line where a duct penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.
3. A listed ceiling radiation damper and firestopping is installed at the ceiling line where a diffuser with no duct attached penetrates the ceiling of a fire-resistance-rated floor/ceiling or roof/ceiling assembly.

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**716.6.2.1 Ceiling radiation dampers.** Ceiling radiation dampers shall be tested as part of a fire-resistance-rated floor/ceiling or roof/ceiling assembly in accordance with ASTM E 119 or UL 263. Ceiling radiation dampers shall be installed in accordance with the details listed in a fire-resistance-rated assembly and the manufacturer's installation instructions and the listing.† Ceiling radiation dampers are not required where either of the following applies:

1. Tests in accordance with ASTM E 119 or UL 263 have shown that ceiling radiation dampers are not necessary in order to maintain the fire-resistance rating of the assembly.
2. Where exhaust duct penetrations are protected in accordance with Section 713.4.1.2 are located within the cavity of a wall and do not pass through another dwelling unit or tenant space.

**716.6.3 Nonfire-resistance-rated floor assemblies.** Duct systems constructed of approved materials in accordance with the *New York City Mechanical Code* that penetrate

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nonfire-resistance-rated floor assemblies shall be protected by any of the following methods:

1. A shaft enclosure in accordance with Section 708.
2. The duct connects‡ not more than two stories and the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion.
3. The duct connects not more than three stories and the annular space around the penetrating duct is protected with an approved noncombustible material that resists the free passage of flame and the products of combustion, and a fire damper is installed at each floor line.

**Exception:** Fire dampers are not required in ducts within individual residential dwelling units.

**716.7 Flexible ducts and air connectors.** Flexible ducts and air connectors shall not pass through any fire-resistance-rated assembly. Flexible air connectors shall not pass through any wall, floor or ceiling.

## SECTION BC 717 CONCEALED SPACES

**717.1 General.** Fireblocking and draftstopping shall be installed in combustible and noncombustible concealed locations in accordance with this section. Fireblocking shall comply with Section 717.2. Draftstopping in floor/ceiling spaces and attic spaces shall comply with Sections 717.3 and 717.4, respectively. The permitted use of combustible materials in concealed spaces of buildings of Type I or II construction shall be limited to the applications indicated in Section 717.5. Installations of fireblocking and draftstopping shall comply with the special inspection requirements of Chapter 17.

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**Exception:** Concealed spaces that are sprinklered in accordance with Chapter 9 or are constructed as a shaft.

**717.2 Fireblocking.** In combustible and noncombustible construction, fireblocking shall be installed to cut off concealed draft openings (both vertical and horizontal) and shall form an effective barrier between floors, between a top story and a roof or attic space. Fireblocking shall be installed in the locations specified in Sections 717.2.2 through 717.2.7.

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**717.2.1 Fireblocking materials.** Fireblocking shall consist of the following materials:

1. Two-inch (51 mm) nominal lumber.
2. Two thicknesses of 1-inch (25 mm) nominal lumber with broken lap joints.
3. One thickness of 0.719-inch (18.3 mm) wood structural panel with joints backed by 0.719-inch (18.3 mm) wood structural panels.
4. One thickness of 0.75-inch (19 mm) particleboard with joints backed by 0.75-inch (19 mm) particleboard.
5. One-half-inch (12.7 mm) gypsum board.

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6. One-fourth-inch (6.4 mm) cement based millboard.
7. Batts or blankets of mineral wool,‡ mineral fiber or other approved materials installed in such a manner as to be securely retained in place.

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**717.2.1.1 Batts or blankets of mineral wool or mineral fiber.** Batts or blankets of mineral or glass fiber or other approved nonrigid materials shall be permitted for compliance with the 10-foot (3048 mm) horizontal fireblocking in walls constructed using parallel rows of studs or staggered studs.

**717.2.1.2 Unfaced fiberglass.** Unfaced fiberglass batt insulation used as fireblocking shall fill the entire cross section of the wall cavity to a minimum height of 16 inches (406 mm) measured vertically. When piping, conduit or similar obstructions are encountered, the insulation shall be packed tightly around the obstruction.

**717.2.1.3 Loose-fill insulation material.** Loose-fill insulation material, insulating foam sealants and caulk materials shall not be used as a fire block unless specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and to retard the spread of fire and hot gases.

**717.2.1.4 Fireblocking integrity.** The integrity of fire blocks shall be maintained.

**717.2.1.5 Double stud walls.** Batts or blankets of mineral or glass fiber or other approved nonrigid materials shall be allowed as fireblocking in walls constructed using parallel rows of studs or staggered studs.

**717.2.2 Concealed wall spaces.** Fireblocking shall be provided in concealed spaces of stud walls and partitions, including furred spaces, and parallel rows of studs or staggered studs, as follows:

1. Vertically at the ceiling and floor levels.
2. Horizontally at intervals not exceeding 10 feet (3048 mm).

**717.2.3 Connections between horizontal and vertical spaces.** Fireblocking shall be provided at interconnections between concealed vertical stud wall or partition spaces and concealed horizontal spaces created by an assembly of floor joists or trusses, and between concealed vertical and horizontal spaces such as occur at soffits, drop ceilings, cove ceilings and similar locations.

**717.2.4 Stairways.** Fireblocking shall be provided in concealed spaces between stair stringers at the top and bottom of the run. Enclosed spaces under stairs shall also comply with Section 1009.6.3.

**717.2.5 Ceiling and floor openings.** Where required by Exception 6 of Section 708.2, Exception 1 of Section 713.4.1.2, or Section 713.4.2‡ fireblocking of the annular space around vents, pipes, ducts, chimneys and fireplaces at ceiling and floor levels shall be installed with a material specifically tested in the form and manner intended for use to demonstrate its ability to remain in place and resist the free passage of flame and the products of combustion.

**717.2.5.1 Factory-built chimneys and fireplaces.** Factory-built chimneys and fireplaces shall be fire blocked in accordance with UL 103 and UL 127.

**717.2.6 Architectural trim.** Fireblocking shall be installed within concealed spaces of exterior wall finish and other exterior architectural elements where permitted to be of combustible construction as specified in Section 1406 or where erected with combustible frames, at maximum intervals of 20 feet (6096 mm) so that there will be no open space exceeding 100 square feet (9.3 m<sup>2</sup>). Where wood furring strips are used, they shall be of approved wood of natural decay resistance or preservative-treated wood. If non-continuous, such elements shall have closed ends, with at least 4 inches (102 mm) of separation between sections.

#### Exceptions:

1. Fireblocking of cornices is not required in single-family dwellings. Fireblocking of cornices of a two-family dwelling is required only at the line of dwelling unit separation.
2. Fireblocking shall not be required where installed on noncombustible framing and the face of the exterior wall finish exposed to the concealed space is covered by one of the following materials:
  - 2.1. Aluminum having a minimum thickness of 0.019 inch (0.5 mm).
  - 2.2. Corrosion-resistant steel having a base metal thickness not less than 0.016 inch (0.4 mm) at any point.
  - 2.3. Other approved noncombustible materials.

**717.2.7 Concealed sleeper spaces.** Where wood sleepers are used for laying wood flooring on masonry or concrete fire-resistance-rated floors, the space between the floor slab and the underside of the wood flooring shall be filled with an approved material to resist the free passage of flame and products of combustion or fire blocked in such a manner that there will be no open spaces under the flooring that will exceed 20 square feet (1.86 m<sup>2</sup>) in area and such space shall be filled solidly under permanent partitions so that there is no communication under the flooring between adjoining rooms.

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#### Exceptions:

1. Fireblocking is not required for slab-on-grade floors in gymnasiums.
2. Fireblocking is required only at the juncture of each alternate lane and at the ends of each lane in a bowling facility.

**717.3 Draftstopping in floors.** In combustible and noncombustible construction, draftstopping shall be installed to subdivide floor/ceiling assemblies in the locations prescribed in Sections 717.3.2 through 717.3.3.

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**717.3.1 Draftstopping materials.** In noncombustible construction, draftstopping shall be of noncombustible materials. In combustible construction, draftstopping materials shall not be less than 1/2-inch (12.7 mm) gypsum

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board,  $\frac{3}{8}$ -inch (9.5 mm) wood structural panel,  $\frac{3}{8}$ -inch (9.5 mm) particleboard, 1-inch (25 mm) nominal lumber, cement fiberboard, batts or blankets of mineral wool or glass fiber, or other approved materials adequately supported. The integrity of draft stops shall be maintained.

**NYC** **717.3.2 Group R.** Draftstopping shall be provided in floor/ceiling spaces in Group R buildings. Draftstopping shall be located above and in line with the dwelling unit separations.

**Exceptions:**

1. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2, provided that automatic sprinklers are also installed in the combustible concealed spaces.
3. Where laminated wood I-joist assemblies are used, the space between the ceiling and the floor or roof above shall be divided into approximately equal areas not greater than 500 square feet (46.5 m<sup>2</sup>).
4. Draftstopping shall not be required where the structural members within the concealed ceiling space are individually protected on all sides for their full length with materials having the required fire-resistance rating.

**NYC** **717.3.3 Other groups.** In occupancies other than Group R, draft stopping shall be installed so that horizontal floor areas do not exceed 3,000 square feet (279 m<sup>2</sup>).

**Exceptions:**

1. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Draftstopping shall not be required where the structural members within the concealed ceiling space are individually protected on all sides for their full length with materials having the required fire-resistance rating.

**NYC** **717.4 Draftstopping in attics.** In combustible and noncombustible construction, draftstopping shall be installed to subdivide attic spaces and concealed roof spaces in the locations prescribed in Sections 717.4.2 and 717.4.3. Ventilation of concealed roof spaces shall be maintained in accordance with Section 1203.2.

**717.4.1 Draftstopping materials.** Materials utilized for draftstopping of attic spaces shall comply with Section 717.3.1.

**NYC** **717.4.1.1 Openings.** Openings in draftstop partitions provided in accordance with Section 1209.2 shall be protected by self-closing doors with automatic latches constructed as required for the partitions.

**717.4.2 Groups R-1 and R-2.** Draftstopping shall be provided in attics, mansards, overhangs or other concealed

roof spaces of Group R-2 buildings with three or more dwelling units and in all Group R-1 buildings. Draftstopping shall be installed above, and in line with, dwelling unit separation walls that do not extend to the underside of the roof sheathing above.

**Exceptions:**

1. Draftstopping shall not be required where the structural members within the concealed attic space are individually protected on all sides for their full length with materials having the required fire-resistance rating.
2. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
3. In occupancies in Group R-2 that do not exceed four stories above grade plane, the attic space shall be subdivided by draft stops into areas not exceeding 3,000 square feet (279 m<sup>2</sup>) or above every two dwelling units, whichever is smaller.
4. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2, provided that automatic sprinklers are also installed in the combustible concealed spaces.
5. Where laminated wood I-joist assemblies are used, the space between the ceiling and the floor or roof above shall be divided into approximately equal areas not greater than 500 square feet (46.5 m<sup>2</sup>).

**717.4.3 Other groups.** Draftstopping shall be installed in attics and concealed roof spaces, such that any horizontal area does not exceed 3,000 square feet (279 m<sup>2</sup>).

**Exceptions:**

1. Draftstopping is not required in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Draftstopping shall not be required where the structural members within the concealed attic space are individually protected on all sides for their full length with materials having the required fire-resistance rating.
3. Where laminated wood I-joist assemblies are used, the space between the ceiling and the floor or roof above shall be divided into approximately equal areas not greater than 500 square feet (46.5 m<sup>2</sup>).

**717.5 Combustible materials in concealed spaces in Type I or II construction.** Combustible materials shall not be permitted in concealed spaces of buildings of Type I or II construction.

**Exceptions:**

1. Combustible materials in accordance with Section 603.

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- foil insulations, shall comply with the requirements of this section. Where a flame spread index or a smoke-development index is specified in this section, such index shall be determined in accordance with ASTM E 84 or UL 723. Any material that is subject to an increase in flame spread index or smoke-development index beyond the limits herein established through the effects of age, moisture, or other atmospheric conditions shall not be permitted.

1. Fiberboard insulation shall comply with Chapter 23.
2. Foam plastic insulation shall comply with Chapter 26.
3. Duct and pipe insulation and duct and pipe coverings and linings in plenums shall comply with the *New York City Mechanical Code*.
4. Exterior insulation finish systems (EIFS) shall comply with Chapters 14 and 26.

1. Satisfactorily pass a test for determining noncombustibility of elementary materials, based on the test procedures of ASTM E 136; or
2. Have a flame spread index not greater than 25, a smoke-development index not greater than 50, and be without evidence of continued progressive combustion when tested in accordance with ASTM E 84.

**719.1.2 Combustible construction.** Insulating materials used in combustible construction shall have a flame spread index not greater than 25, a smoke-development index not greater than 450, and be without evidence of continuous progressive combustion when tested in accordance with ASTM E 84.

**719.2 Concealed installation.** Insulating materials, where concealed as installed in buildings of any type construction, shall comply with Sections 719.1, 719.1.1 and 719.1.2. Concealed insulation shall be separated from the building interior by a thermal barrier consisting of at least 1/2-inch-thick (12.7 mm) gypsum wallboard or approved equivalent.

**Exception:** Cellulose loose-fill insulation that is not spray applied, complying with the requirements of Section 719.6, shall only be required to meet the smoke-development index of not more than 450.

**719.2.1 Facings.** Where such materials are installed in concealed spaces in buildings of Type III, IV or V construction, the flame spread and smoke-development limits do not apply to facings, coverings, and layers of reflective foil insulation that are installed behind and in substantial contact with the unexposed surface of the ceiling, wall or floor finish.

**Exception:** All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

**718.1 Thickness of plaster.** The minimum thickness of gypsum plaster or portland cement plaster used in a fire-resistance-rated system shall be determined by the prescribed fire tests. The plaster thickness shall be measured from the face of the lath where applied to gypsum lath or metal lath.

**718.2 Plaster equivalents.** For fire-resistance purposes,  $\frac{1}{2}$  inch (12.7 mm) of unsanded gypsum plaster shall be deemed equivalent to  $\frac{3}{4}$  inch (19.1 mm) of one-to-three gypsum sand plaster or 1 inch (25 mm) of portland cement sand plaster.

**718.3 Noncombustible furring.** In buildings of Type I and II construction, plaster shall be applied directly on concrete or masonry or on approved noncombustible plastering base and furring.

**718.4 Double reinforcement.** Plaster protection more than 1 inch (25 mm) in thickness shall be reinforced with an additional layer of approved lath embedded at least  $\frac{3}{4}$  inch (19.1 mm) from the outer surface and fixed securely in place.

**Exception:** Solid plaster partitions or where otherwise determined by fire tests.

**718.5 Plaster alternatives for concrete.** In reinforced concrete construction, gypsum plaster or portland cement plaster is permitted to be substituted for  $\frac{1}{2}$  inch (12.7 mm) of the required poured concrete protection, except that a minimum thickness of  $\frac{3}{8}$  inch (9.5 mm) of poured concrete shall be provided in reinforced concrete floors and 1 inch (25 mm) in reinforced concrete columns in addition to the plaster finish. The concrete base shall be prepared in accordance with Section 2510.7.

**719.1 General.** Insulating materials, including facings such as vapor retarders and vapor-permeable membranes, similar coverings, and all layers of single and multilayer reflective



**NYC 719.3 Exposed installation.** Insulation materials, where exposed as installed in buildings of any type construction, shall have a flame spread index of not more than 25 and a smoke-development index of not more than 50.

**NYC** **Exception:** Cellulose loose-fill insulation that is not spray applied complying with the requirements of Section 719.6 shall only be required to meet the smoke-development index of not more than 50.

**719.3.1 Attic floors.** Exposed insulation materials installed on attic floors shall have a critical radiant flux of not less than 0.12 watt per square centimeter when tested in accordance with ASTM E 970.

**NYC 719.3.2 Toxicity.** Upon exposure to fire, insulating materials used in building interiors, including facings, such as vapor retarders and vapor-permeable membranes, similar coverings, and all layers of single and multilayer reflective foil insulation, shall not produce products of decomposition or combustion that are more toxic in point of concentration than those given off by wood or paper when decomposing or burning under comparable conditions in accordance with test standards approved by the department.

**NYC 719.4 Loose-fill insulation.** Loose-fill insulation materials that cannot be mounted in the ASTM E 84 apparatus without a screen or artificial supports shall comply with the flame spread and smoke-developed limits of Sections 719.2 and 719.3 when tested in accordance with CAN/ULC S102.2.

**Exception:** Cellulose loose-fill insulation shall not be required to be tested in accordance with CAN/ULC S 102.2, provided such insulation complies with the requirements of Section 719.2 or 719.3, as applicable, and Section 719.6.

**NYC 719.5 Roof insulation.** The use of combustible roof insulation not complying with Sections 719.2 and 719.3 shall be permitted in any type construction provided it is applied on top of roof decking or slab and is covered with approved roof coverings directly applied thereto.

**719.6 Cellulose loose-fill insulation.** Cellulose loose-fill insulation shall comply with CPSC 16 CFR, Part 1209 and CPSC 16 CFR, Part 1404. Each package of such insulating material shall be clearly labeled in accordance with CPSC 16 CFR, Part 1209 and CPSC 16 CFR, Part 1404.

**NYC 719.7 Insulation and covering on pipe and tubing.** Insulation and covering on pipe and tubing shall comply with the requirements of the *New York City Mechanical Code*, the *New York City Plumbing Code*, and the *New York City Energy Conservation Code*.



## SECTION BC 720 PRESCRIPTIVE FIRE RESISTANCE

**720.1 General.** The provisions of this section contain prescriptive details of fire-resistance-rated building elements, components or assemblies. The materials of construction listed in Tables 720.1(1), 720.1(2), and 720.1(3) shall be

assumed to have the fire-resistance ratings prescribed therein. Where materials that change the capacity for heat dissipation are incorporated into a fire-resistance-rated assembly, fire test results or other substantiating data shall be made available to the commissioner to show that the required fire-resistance-rating time period is not reduced. **NYC**

**720.1.1 Thickness of protective coverings.** The thickness of fire-resistant materials required for protection of structural members shall be not less than set forth in Table 720.1(1), except as modified in this section. The figures shown shall be the net thickness of the protecting materials and shall not include any hollow space in back of the protection.

**720.1.2 Unit masonry protection.** Where required, metal ties shall be embedded in bed joints of unit masonry for protection of steel columns. Such ties shall be as set forth in Table 720.1(1) or be equivalent thereto.

**720.1.3 Reinforcement for cast-in-place concrete column protection.** Cast-in-place concrete protection for steel columns shall be reinforced at the edges of such members with wire ties of not less than 0.18 inch (4.6 mm) in diameter wound spirally around the columns on a pitch of not more than 8 inches (203 mm) or by equivalent reinforcement.

**720.1.4 Plaster application.** The finish coat is not required for plaster protective coatings where they comply with the design mix and thickness requirements of Tables 720.1(1), 720.1(2) and 720.1(3).

**720.1.5 Bonded prestressed concrete tendons.** For members having a single tendon or more than one tendon installed with equal concrete cover measured from the nearest surface, the cover shall not be less than that set forth in Table 720.1(1). For members having multiple tendons installed with variable concrete cover, the average tendon cover shall not be less than that set forth in Table 720.1(1), provided:

1. The clearance from each tendon to the nearest exposed surface is used to determine the average cover.
2. In no case can the clear cover for individual tendons be less than one-half of that set forth in Table 720.1(1). A minimum cover of  $\frac{3}{4}$  inch (19.1 mm) for slabs and 1 inch (25 mm) for beams is required for any aggregate concrete.
3. For the purpose of establishing a fire-resistance rating, tendons having a clear covering less than that set forth in Table 720.1(1) shall not contribute more than 50 percent of the required ultimate moment capacity for members less than 350 square inches (0.226 m<sup>2</sup>) in cross-sectional area and 65 percent for larger members. For structural design purposes, however, tendons having a reduced cover are assumed to be fully effective.



**TABLE 720.1(1)**  
**MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR**  
**VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS<sup>m</sup>**

STRUCTURAL PARTS TO BE PROTECTED	ITEM NUMBER	INSULATING MATERIAL USED	MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches)			
			4 hour	3 hour	2 hour	1 hour
1. Steel columns and all of primary trusses	1-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete, members 6" × 6" or greater (not including sandstone, granite and siliceous gravel). <sup>a</sup>	2½	2	1½	1
	1-1.2	Carbonate, lightweight and sand-lightweight aggregate concrete, members 8" × 8" or greater (not including sandstone, granite and siliceous gravel). <sup>a</sup>	2	1½	1	1
	1-1.3	Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" × 12" or greater (not including sandstone, granite and siliceous gravel). <sup>a</sup>	1½	1	1	1
	1-1.4	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 6" × 6" or greater. <sup>a</sup>	3	2	1½	1
	1-1.5	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 8" × 8" or greater. <sup>a</sup>	2½	2	1	1
	1-1.6	Siliceous aggregate concrete and concrete excluded in Item 1-1.1, members 12" × 12" or greater. <sup>a</sup>	2	1	1	1
	1-2.1	Clay or shale brick with brick and mortar fill. <sup>a</sup>	¾	—	—	¾
	1-3.1	4" hollow clay tile in two 2" layers; ½" mortar between tile and column; ⅜" metal mesh 0.046" wire diameter in horizontal joints; tile fill. <sup>a</sup>	4	—	—	—
	1-3.2	2" hollow clay tile; ⅜" mortar between tile and column; ⅜" metal mesh 0.046" wire diameter in horizontal joints; limestone concrete fill; <sup>a</sup> plastered with ¾" gypsum plaster.	3	—	—	—
	1-3.3	2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile or ⅜" metal mesh 0.046" diameter wire in horizontal joints; limestone or trap-rock concrete fill <sup>a</sup> extending 1" outside column on all sides.	—	—	3	—
	1-3.4	2" hollow clay tile with outside wire ties 0.08" diameter at each course of tile with or without concrete fill; ¾" mortar between tile and column.	—	—	—	2
	1-4.1	Cement plaster over metal lath wire tied to ¾" cold-rolled vertical channels with 0.049V (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 ½ by volume, cement to sand.	—	—	2½ <sup>b</sup>	7/8
	1-5.1	Vermiculite concrete, 1:4 mix by volume over paperbacked wire fabric lath wrapped directly around column with additional 2" × 2" 0.065"/0.065" (No. 16/16 B.W. gage) wire fabric placed ¾" from outer concrete surface. Wire fabric tied with 0.049" (No. 18 B.W. gage) wire spaced 6" on center for inner layer and 2" on center for outer layer.	2	—	—	—
	1-6.1	Perlite or vermiculite gypsum plaster over metal lath wrapped around column and furred 1¼" from column flanges. Sheets lapped at ends and tied at 6" intervals with 0.049" (No. 18 B.W. gage) tie wire. Plaster pushed through to flanges.	1½	1	—	—
	1-6.2	Perlite or vermiculite gypsum plaster over self-furring metal lath wrapped directly around column, lapped 1" and tied at 6" intervals with 0.049" (No. 18 B.W. gage) wire.	1¾	1⅜	1	—
	1-6.3	Perlite or vermiculite gypsum plaster on metal lath applied to ¾" cold-rolled channels spaced 24" apart vertically and wrapped flatwise around column.	1½	—	—	—
	1-6.4	Perlite or vermiculite gypsum plaster over two layers of ½" plain full-length gypsum lath applied tight to column flanges. Lath wrapped with 1" hexagonal mesh of No. 20 gage wire and tied with doubled 0.035" diameter (No. 18 B.W. gage) wire ties spaced 23" on center. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the 3-hour system.	2½	2	—	—

(continued)

**TABLE 720.1(1)—continued**  
**MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR**  
**VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS<sup>m</sup>**

STRUCTURAL PARTS TO BE PROTECTED	ITEM NUMBER	INSULATING MATERIAL USED	MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches)			
			4 hour	3 hour	2 hour	1 hour
1. Steel columns and all of primary trusses	1-6.5	Perlite or vermiculate gypsum plaster over one layer of $\frac{1}{2}$ " plain full-length gypsum lath applied tight to column flanges. Lath tied with doubled 0.049" (No. 18 B.W. gage) wire ties spaced 23" on center and scratch coat wrapped with 1" hexagonal mesh 0.035" (No. 20 B.W. gage) wire fabric. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2 $\frac{1}{2}$ cubic feet of aggregate.	—	2	—	—
	1-7.1	Multiple layers of $\frac{1}{2}$ " gypsum wallboard <sup>c</sup> adhesively <sup>d</sup> secured to column flanges and successive layers. Wallboard applied without horizontal joints. Corner edges of each layer staggered. Wallboard layer below outer layer secured to column with doubled 0.049" (No. 18 B.W. gage) steel wire ties spaced 15" on center. Exposed corners taped and treated.	—	—	2	1
	1-7.2	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard. <sup>c</sup> First and second layer held in place by $\frac{1}{8}$ " diameter by $1\frac{3}{8}$ " long ring shank nails with $\frac{5}{16}$ " diameter heads spaced 24" on center at corners. Middle layer also secured with metal straps at mid-height and 18" from each end, and by metal corner bead at each corner held by the metal straps. Third layer attached to corner bead with 1" long gypsum wallboard screws spaced 12" on center.	—	—	1 $\frac{7}{8}$	—
	1-7.3	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard, <sup>c</sup> each layer screw attached to $1\frac{5}{8}$ " steel studs 0.018" thick (No. 25 carbon sheet steel gage) at each corner of column. Middle layer also secured with 0.049" (No. 18 B.W. gage) double-strand steel wire ties, 24" on center. Screws are No. 6 by 1" spaced 24" on center for inner layer, No. 6 by $1\frac{5}{8}$ " spaced 12" on center for middle layer and No. 8 by $2\frac{1}{4}$ " spaced 12" on center for outer layer.	—	1 $\frac{7}{8}$	—	—
	1-8.1	Wood-fibered gypsum plaster mixed 1:1 by weight gypsum-to-sand aggregate applied over metal lath. Lath lapped 1" and tied 6" on center at all end, edges and spacers with 0.049" (No. 18 B.W. gage) steel tie wires. Lath applied over $\frac{1}{2}$ " spacers made of $\frac{3}{4}$ " furring channel with 2" legs bent around each corner. Spacers located 1" from top and bottom of member and a maximum of 40" on center and wire tied with a single strand of 0.049" (No. 18 B.W. gage) steel tie wires. Corner bead tied to the lath at 6" on center along each corner to provide plaster thickness.	—	—	1 $\frac{5}{8}$	—
	1-9.1	Minimum W8×35 wide flange steel column (w/d > 0.75) with each web cavity filled even with the flange tip with normal weight carbonate or siliceous aggregate concrete (3,000 psi minimum compressive strength with 145 pcf ± 3 pcf unit weight). Reinforce the concrete in each web cavity with a minimum No. 4 deformed reinforcing bar installed vertically and centered in the cavity, and secured to the column web with a minimum No. 2 horizontal deformed reinforcing bar welded to the web every 18" on center vertically. As an alternative to the No. 4 rebar, 3/4" diameter by 3" long headed studs, spaced at 12" on center vertically, shall be welded on each side of the web midway between the column flanges.	—	—	—	See Note n
2. Webs or flanges of steel beams and girders	2-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete (not including sandstone, granite and siliceous gravel) with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction.	2	1 $\frac{1}{2}$	1	1
	2-1.2	Siliceous aggregate concrete and concrete excluded in Item 2-1.1 with 3" or finer metal mesh placed 1" from the finished surface anchored to the top flange and providing not less than 0.025 square inch of steel area per foot in each direction.	2 $\frac{1}{2}$	2	1 $\frac{1}{2}$	1
	2-2.1	Cement plaster on metal lath attached to $\frac{3}{4}$ " cold-rolled channels with 0.049" (No. 18 B.W. gage) wire ties spaced 3" to 6" on center. Plaster mixed 1:2 $\frac{1}{2}$ by volume, cement to sand.	—	—	2 $\frac{1}{2}$ <sup>b</sup>	$\frac{7}{8}$
	2-3.1	Vermiculite gypsum plaster on a metal lath cage, wire tied to 0.165" diameter (No. 8 B.W. gage) steel wire hangers wrapped around beam and spaced 16" on center. Metal lath ties spaced approximately 5" on center at cage sides and bottom.	—	$\frac{7}{8}$	—	—

(continued)

**TABLE 720.1(1)—continued**  
**MINIMUM PROTECTION OF STRUCTURAL PARTS BASED ON TIME PERIODS FOR**  
**VARIOUS NONCOMBUSTIBLE INSULATING MATERIALS<sup>m</sup>**

STRUCTURAL PARTS TO BE PROTECTED	ITEM NUMBER	INSULATING MATERIAL USED	MINIMUM THICKNESS OF INSULATING MATERIAL FOR THE FOLLOWING FIRE-RESISTANCE PERIODS (inches)			
			4 hour	3 hour	2 hour	1 hour
2. Webs or flanges of steel beams and girders	2-4.1	Two layers of $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> are attached to U-shaped brackets spaced 24" on center. 0.018" thick (No. 25 carbon sheet steel gage) $1\frac{3}{8}$ " deep by 1" galvanized steel runner channels are first installed parallel to and on each side of the top beam flange to provide a $\frac{1}{2}$ " clearance to the flange. The channel runners are attached to steel deck or concrete floor construction with approved fasteners spaced 12" on center. U-shaped brackets are formed from members identical to the channel runners. At the bent portion of the U-shaped bracket, the flanges of the channel are cut out so that $1\frac{5}{8}$ " deep corner channels can be inserted without attachment parallel to each side of the lower flange. As an alternate, 0.021" thick (No. 24 carbon sheet steel gage) 1" x 2" runner and corner angles may be used in lieu of channels, and the web cutouts in the U-shaped brackets may be omitted. Each angle is attached to the bracket with $\frac{1}{2}$ "-long No. 8 self-drilling screws. The vertical legs of the U-shaped bracket are attached to the runners with one $\frac{1}{2}$ " long No. 8 self-drilling screw. The completed steel framing provides a $2\frac{1}{8}$ " and $1\frac{1}{2}$ " space between the inner layer of wallboard and the sides and bottom of the steel beam, respectively. The inner layer of wallboard is attached to the top runners and bottom corner channels or corner angles with $1\frac{1}{4}$ "-long No. 6 self-drilling screws spaced 16" on center. The outer layer of wallboard is applied with $1\frac{3}{4}$ "-long No. 6 self-drilling screws spaced 8" on center. The bottom corners are reinforced with metal corner beads.	—	—	$1\frac{1}{4}$	—
	2-4.2	Three layers of $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> attached to a steel suspension system as described immediately above utilizing the 0.018" thick (No. 25 carbon sheet steel gage) 1" x 2" lower corner angles. The framing is located so that a $2\frac{1}{8}$ " and 2" space is provided between the inner layer of wallboard and the sides and bottom of the beam, respectively. The first two layers of wallboard are attached as described immediately above. A layer of 0.035" thick (No. 20 B.W. gage) 1" hexagonal galvanized wire mesh is applied under the soffit of the middle layer and up the sides approximately 2". The mesh is held in position with the No. 6 $1\frac{5}{8}$ "-long screws installed in the vertical leg of the bottom corner angles. The outer layer of wallboard is attached with No. 6 $2\frac{1}{4}$ "-long screws spaced 8" on center. One screw is also installed at the mid-depth of the bracket in each layer. Bottom corners are finished as described above.	—	$1\frac{7}{8}$	—	—
3. Bonded pretensioned reinforcement in pre-stressed concrete <sup>e</sup>	3-1.1	Carbonate, lightweight, sand-lightweight and siliceous <sup>f</sup> aggregate concrete Beams or girders Solid slabs <sup>h</sup>	4 <sup>g</sup>	3 <sup>g</sup> 2	$2\frac{1}{2}$ $1\frac{1}{2}$	$1\frac{1}{2}$ 1
4. Bonded or unbonded post-tensioned tendons in prestressed concrete <sup>e,i</sup>	4-1.1	Carbonate, lightweight, sand-lightweight and siliceous <sup>f</sup> aggregate concrete Unrestrained members: Solid slabs <sup>h</sup> Beams and girders <sup>j</sup> 8" wide greater than 12" wide	— 3	2 $4\frac{1}{2}$ $2\frac{1}{2}$	$1\frac{1}{2}$ $2\frac{1}{2}$ 2	— $1\frac{3}{4}$ $1\frac{1}{2}$
	4-1.2	Carbonate, lightweight, sand-lightweight and siliceous aggregate Restrained members: <sup>k</sup> Solid slabs <sup>h</sup> Beams and girders <sup>j</sup> 8" wide greater than 12" wide	$1\frac{1}{4}$ $2\frac{1}{2}$ 2	1 2 $1\frac{3}{4}$	$\frac{3}{4}$ $1\frac{3}{4}$ $1\frac{1}{2}$	— — —
5. Reinforcing steel in reinforced concrete columns, beams girders and trusses	5-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.) Siliceous aggregate concrete, members 12" or larger, square or round. (Size limit does not apply to beams and girders monolithic with floors.)	$1\frac{1}{2}$ 2	$1\frac{1}{2}$ $1\frac{1}{2}$	$1\frac{1}{2}$ $1\frac{1}{2}$	$1\frac{1}{2}$ $1\frac{1}{2}$
6. Reinforcing steel in reinforced concrete joists <sup>l</sup>	6-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete.	$1\frac{1}{4}$	$1\frac{1}{4}$	1	$\frac{3}{4}$
	6-1.2	Siliceous aggregate concrete.	$1\frac{3}{4}$	$1\frac{1}{2}$	1	$\frac{3}{4}$
7. Reinforcing and tie rods in floor and roof slabs <sup>l</sup>	7-1.1	Carbonate, lightweight and sand-lightweight aggregate concrete.	1	1	$\frac{3}{4}$	$\frac{3}{4}$
	7-1.2	Siliceous aggregate concrete.	$1\frac{1}{4}$	1	1	$\frac{3}{4}$

**NYC** For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm<sup>2</sup>, 1 cubic foot = 0.0283 m<sup>3</sup>.

a. Reentrant parts of protected members to be filled solidly.

b. Two layers of equal thickness with a  $\frac{3}{4}$ -inch airspace between.

(continued)

**Table 720.1 (1) Notes—continued**

- c. For all of the construction with gypsum wallboard described in Table 720.1(1), gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard and the joints on the face layer are reinforced, and the entire surface is covered with a minimum of  $\frac{1}{16}$ -inch gypsum veneer plaster.
- d. An approved adhesive qualified under ASTM E 119 or UL 263.
- e. Where lightweight or sand-lightweight concrete having an oven-dry weight of 110 pounds per cubic foot or less is used, the tabulated minimum cover shall be permitted to be reduced 25 percent, except that in no case shall the cover be less than  $\frac{3}{4}$  inch in slabs or  $1\frac{1}{2}$  inches in beams or girders.
- f. For solid slabs of siliceous aggregate concrete, increase tendon cover 20 percent.
- g. Adequate provisions against spalling shall be provided by U-shaped or hooped stirrups spaced not to exceed the depth of the member with a clear cover of 1 inch.
- h. Prestressed slabs shall have a thickness not less than that required in Table 720.1(3) for the respective fire resistance time period.
- i. Fire coverage and end anchorages shall be as follows: Cover to the prestressing steel at the anchor shall be  $\frac{1}{2}$  inch greater than that required away from the anchor. Minimum cover to steel-bearing plate shall be 1 inch in beams and  $\frac{3}{4}$  inch in slabs.
- j. For beam widths between 8 inches and 12 inches, cover thickness shall be permitted to be determined by interpolation.
- k. Interior spans of continuous slabs, beams and girders shall be permitted to be considered restrained.
- l. For use with concrete slabs having a comparable fire endurance where members are framed into the structure in such a manner as to provide equivalent performance to that of monolithic concrete construction.
- m. Generic fire-resistance ratings (those not designated as PROPRIETARY\* in the listing) in GA 600 shall be accepted as if herein listed.
- n. No additional insulating material is required on an exposed outside face of the column flange to achieve a 1-hour fire-resistance rating.

NYC

**TABLE 720.1(2)**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS<sup>a, o, p</sup>**

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
1. Brick of clay or shale	1-1.1	Solid brick of clay or shale <sup>c</sup>	6	4.9	3.8	2.7
	1-1.2	Hollow brick, not filled.	5.0	4.3	3.4	2.3
	1-1.3	Hollow brick unit wall, grout or filled with perlite vermiculite or expanded shale aggregate.	6.6	5.5	4.4	3.0
	1-2.1	4" nominal thick units at least 75 percent solid backed with a hat-shaped metal furring channel $\frac{3}{4}$ " thick formed from 0.021" sheet metal attached to the brick wall on 24" centers with approved fasteners, and $\frac{1}{2}$ " Type X gypsum wallboard attached to the metal furring strips with 1"-long Type S screws spaced 8" on center.	—	—	5 <sup>d</sup>	—
2. Combination of clay brick and load-bearing hollow clay tile	2-1.1	4" solid brick and 4" tile (at least 40 percent solid).	—	8	—	—
	2-1.2	4" solid brick and 8" tile (at least 40 percent solid).	12	—	—	—
3. Concrete masonry units	3-1.1 <sup>f, g</sup>	Expanded slag or pumice.	4.7	4.0	3.2	2.1
	3-1.2 <sup>f, g</sup>	Expanded clay, shale or slate.	5.1	4.4	3.6	2.6
	3-1.3 <sup>f</sup>	Limestone, cinders or air-cooled slag.	5.9	5.0	4.0	2.7
	3-1.4 <sup>f, g</sup>	Calcareous or siliceous gravel.	6.2	5.3	4.2	2.8
4. Solid concrete <sup>b, i</sup>	4-1.1	Siliceous aggregate concrete.	7.0	6.2	5.0	3.5
		Carbonate aggregate concrete.	6.6	5.7	4.6	3.2
		Sand-lightweight concrete.	5.4	4.6	3.8	2.7
		Lightweight concrete.	5.1	4.4	3.6	2.5
5. Glazed or unglazed facing tile, nonload-bearing	5-1.1	One 2" unit cored 15 percent maximum and one 4" unit cored 25 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions reversed in alternate courses.	—	6 $\frac{3}{8}$	—	—
	5-1.2	One 2" unit cored 15 percent maximum and one 4" unit cored 40 percent maximum with $\frac{3}{4}$ " mortar-filled collar joint. Unit positions side with $\frac{3}{4}$ " gypsum plaster. Two wythes tied together every fourth course with No. 22 gage corrugated metal ties.	—	6 $\frac{3}{8}$	—	—
	5-1.3	One unit with three cells in wall thickness, cored 29 percent maximum.	—	—	6	—
	5-1.4	One 2" unit cored 22 percent maximum and one 4" unit cored 41 percent maximum with $\frac{1}{4}$ " mortar-filled collar joint. Two wythes tied together every third course with 0.030" (No. 22 galvanized sheet steel gage) corrugated metal ties.	—	—	6	—
	5-1.5	One 4" unit cored 25 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side.	—	—	4 $\frac{3}{4}$	—
	5-1.6	One 4" unit with two cells in wall thickness, cored 22 percent maximum.	—	—	—	4
	5-1.7	One 4" unit cored 30 percent maximum with $\frac{3}{4}$ " vermiculite gypsum plaster on one side.	—	—	4 $\frac{1}{2}$	—
	5-1.8	One 4" unit cored 39 percent maximum with $\frac{3}{4}$ " gypsum plaster on one side.	—	—	—	4 $\frac{1}{2}$

(continued)



**TABLE 720.1(2)—continued**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS<sup>a, o, p</sup>**

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
6. Solid gypsum plaster	6-1.1	$\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with 2.6-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. Gage) wire at 6" spacing. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2 <sup>d</sup>
	6-1.2	$\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) cold-rolled channels 16" on center with metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Perlite or vermiculite gypsum plaster each side. For three-coat work, the plaster mix for the second coat shall not exceed 100 pounds of gypsum to 2½ cubic feet of aggregate for the 1-hour system.	—	—	2½ <sup>d</sup>	2 <sup>d</sup>
	6-1.3	$\frac{3}{4}$ " by 0.055" (No. 16 carbon sheet steel gage) vertical cold-rolled channels, 16" on center with $\frac{3}{8}$ " gypsum lath applied to one face and attached with sheet metal clips. Gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2 <sup>d</sup>
	6-2.1	Studless with ½" full-length plain gypsum lath and gypsum plaster each side. Plaster mixed 1:1 for scratch coat and 1:2 for brown coat, by weight, gypsum to sand aggregate.	—	—	—	2 <sup>d</sup>
	6-2.2	Studless with ½" full-length plain gypsum lath and perlite or vermiculite gypsum plaster each side.	—	—	2½ <sup>d</sup>	2 <sup>d</sup>
	6-2.3	Studless partition with $\frac{3}{8}$ " rib metal lath installed vertically adjacent edges tied 6" on center with No. 18 gage wire ties, gypsum plaster each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	2 <sup>d</sup>
7. Solid perlite and portland cement	7-1.1	Perlite mixed in the ratio of 3 cubic feet to 100 pounds of portland cement and machine applied to stud side of 1½" mesh by 0.058-inch (No. 17 B.W. gage) paper-backed woven wire fabric lath wire-tied to 4"-deep steel trussed wire j studs 16" on center. Wire ties of 0.049" (No. 18 B.W. gage) galvanized steel wire 6" on center vertically.	—	—	3⅛ <sup>d</sup>	—
8. Solid neat wood fibered gypsum plaster	8-1.1	$\frac{3}{4}$ " by 0.055-inch (No. 16 carbon sheet steel gage) cold-rolled channels, 12" on center with 2.5-pound flat metal lath applied to one face and tied with 0.049" (No. 18 B.W. gage) wire at 6" spacing. Neat gypsum plaster applied each side.	—	—	2 <sup>d</sup>	—
9. Solid wallboard partition	9-1.1	One full-length layer ½" Type X gypsum wallboard <sup>d</sup> laminated to each side of 1" full-length V-edge gypsum coreboard with approved laminating compound. Vertical joints of face layer and coreboard staggered at least 3".	—	—	2 <sup>d</sup>	—
10. Hollow (stud-less) gypsum wallboard partition	10-1.1	One full-length layer of $\frac{5}{8}$ " Type X gypsum wallboard <sup>e</sup> attached to both sides of wood or metal top and bottom runners laminated to each side of 1" × 6" full-length gypsum coreboard ribs spaced 24" on center with approved laminating compound. Ribs centered at vertical joints of face plies and joints staggered 24" in opposing faces. Ribs may be recessed 6" from the top and bottom.	—	—	—	2¼ <sup>d</sup>
	10-1.2	1" regular gypsum V-edge full-length backing board attached to both sides of wood or metal top and bottom runners with nails or 1⅝" drywall screws at 24" on center. Minimum width of runners 1⅝". Face layer of ½" regular full-length gypsum wallboard laminated to outer faces of backing board with approved laminating compound.	—	—	4⅝ <sup>d</sup>	—
11. Noncombustible studs—interior partition with plaster each side	11-1.1	3¼" × 0.044" (No. 18 carbon sheet steel gage) steel studs spaced 24" on center. $\frac{5}{8}$ " gypsum plaster on metal lath each side mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	4¾ <sup>d</sup>
	11-1.2	3⅜" × 0.055" (No. 16 carbon sheet steel gage) approved nailable <sup>k</sup> studs spaced 24" on center. $\frac{5}{8}$ " neat gypsum wood-fibered plaster each side over $\frac{3}{8}$ " rib metal lath nailed to studs with 6d common nails, 8" on center. Nails driven 1¼" and bent over.	—	—	5⅝ <sup>d</sup>	—
	11-1.3	4" × 0.044" (No. 18 carbon sheet steel gage) channel-shaped steel studs at 16" on center. On each side approved resilient clips pressed onto stud flange at 16" vertical spacing, ¼" pencil rods snapped into or wire tied onto outer loop of clips, metal lath wire-tied to pencil rods at 6" intervals, 1" perlite gypsum plaster, each side.	—	7⅝ <sup>d</sup>	—	—
	11-1.4	2½" × 0.044" (No. 18 carbon sheet steel gage) steel studs spaced 16" on center. Wood fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied on $\frac{3}{4}$ " -pound metal lath wire tied to studs, each side. $\frac{3}{4}$ " plaster applied over each face, including finish coat.	—	—	4¼ <sup>d</sup>	—

(continued)

**TABLE 720.1(2) —continued**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS** <sup>a, o, p</sup>

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
12. Wood studs interior partition with plaster each side	12-1.1 <sup>l, m</sup>	2" × 4" wood studs 16" on center with $\frac{5}{8}$ " gypsum plaster on metal lath. Lath attached by 4d common nails bent over or No. 14 gage by $\frac{1}{4}$ " by $\frac{3}{4}$ " crown width staples spaced 6" on center. Plaster mixed 1:1½ for scratch coat and 1:3 for brown coat, by weight, gypsum to sand aggregate.	—	—	—	5½
	12-1.2 <sup>l</sup>	2" × 4" wood studs 16" on center with metal lath and $\frac{7}{8}$ " neat wood-fibered gypsum plaster each side. Lath attached by 6d common nails, 7" on center. Nails driven $\frac{1}{4}$ " and bent over.	—	—	5½ <sup>d</sup>	—
	12-1.3 <sup>l</sup>	2" × 4" wood studs 16" on center with $\frac{3}{8}$ " perforated or plain gypsum lath and $\frac{1}{2}$ " gypsum plaster each side. Lath nailed with $\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard blued nails, 4" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	5¼
	12-1.4 <sup>l</sup>	2" × 4" wood studs 16" on center with $\frac{3}{8}$ " Type X gypsum lath and $\frac{1}{2}$ " gypsum plaster each side. Lath nailed with $\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard blued nails, 5" on center. Plaster mixed 1:2 by weight, gypsum to sand aggregate.	—	—	—	5¼
13. Noncombustible studs—interior partition with gypsum wallboard each side	13-1.1	0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 24" on center with one full-length layer of $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> applied vertically attached with 1" long No. 6 drywall screws to each stud. Screws are 8" on center around the perimeter and 12" on center on the intermediate stud. The wallboard may be applied horizontally when attached to $3\frac{5}{8}$ " studs and the horizontal joints are staggered with those on the opposite side. Screws for the horizontal application shall be 8" on center at vertical edges and 12" on center at intermediate studs.	—	—	—	2⅞ <sup>d</sup>
	13-1.2	0.018" (No. 25 carbon sheet steel gage) channel-shaped studs 25" on center with two full-length layers of $\frac{1}{2}$ " Type X gypsum wallboard <sup>c</sup> applied vertically each side. First layer attached with 1"-long, No. 6 drywall screws, 8" on center around the perimeter and 12" on center on the intermediate stud. Second layer applied with vertical joints offset one stud space from first layer using $1\frac{3}{8}$ " long, No. 6 drywall screws spaced 9" on center along vertical joints, 12" on center at intermediate studs and 24" on center along top and bottom runners.	—	—	3⅝ <sup>d</sup>	—
	13-1.3	0.055" (No. 16 carbon sheet steel gage) approved nailable metal studs <sup>c</sup> 24" on center with full-length $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> applied vertically and nailed 7" on center with 6d cement-coated common nails. Approved metal fastener grips used with nails at vertical butt joints along studs.	—	—	—	4⅞
14. Wood studs—interior partition with gypsum wallboard each side	14-1.1 <sup>h, m</sup>	2" × 4" wood studs 16" on center with two layers of $\frac{3}{8}$ " regular gypsum wallboard <sup>c</sup> each side, 4d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 8" on center first layer, 5d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 8" on center second layer with laminating compound between layers, joints staggered. First layer applied full length vertically, second layer applied horizontally or vertically.	—	—	—	5
	14-1.2 <sup>l, m</sup>	2" × 4" wood studs 16" on center with two layers $\frac{1}{2}$ " regular gypsum wallboard <sup>c</sup> applied vertically or horizontally each side <sup>k</sup> , joints staggered. Nail base layer with 5d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 8" on center face layer with 8d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 8" on center.	—	—	—	5½
	14-1.3 <sup>l, m</sup>	2" × 4" wood studs 24" on center with $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> applied vertically or horizontally nailed with 6d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 7" on center with end joints on nailing members. Stagger joints each side.	—	—	—	4¾
	14-1.4 <sup>l</sup>	2" × 4" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> applied with face paper grain (long dimension) parallel to studs. Wallboard attached with 6d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 7" on center.	—	—	—	4¾ <sup>d</sup>
	14-1.5 <sup>l, m</sup>	2" × 4" wood studs 16" on center with two layers $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> each side. Base layers applied vertically and nailed with 6d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 9" on center. Face layer applied vertically or horizontally and nailed with 8d cooler <sup>n</sup> or wallboard <sup>n</sup> nails at 7" on center. For nail-adhesive application, base layers are nailed 6" on center. Face layers applied with coating of approved wallboard adhesive and nailed 12" on center.	—	—	6	—
	14-1.6 <sup>l</sup>	2" × 3" fire-retardant-treated wood studs spaced 24" on center with one layer of $\frac{5}{8}$ " Type X gypsum wallboard <sup>c</sup> applied with face paper grain (long dimension) at right angles to studs. Wallboard attached with 6d cement-coated box nails spaced 7" on center.	—	—	—	3⅝ <sup>d</sup>

(continued)

**TABLE 720.1(2)—continued**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS** <sup>a, o, p</sup>

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
15. Exterior or interior walls	15-1.1 <sup>l, m</sup>	Exterior surface with $\frac{3}{4}$ " drop siding over $\frac{1}{2}$ " gypsum sheathing on 2" × 4" wood studs at 16" on center, interior surface treatment as required for 1-hour-rated exterior or interior 2" × 4" wood stud partitions. Gypsum sheathing nailed with 1 $\frac{3}{4}$ " by No. 11 gage by $\frac{7}{16}$ " head galvanized nails at 8" on center. Siding nailed with 7d galvanized smooth box nails.	—	—	—	Varies
	15-1.2 <sup>l, m</sup>	2" × 4" wood studs 16" on center with metal lath and $\frac{3}{4}$ " cement plaster on each side. Lath attached with 6d common nails 7" on center driven to 1" minimum penetration and bent over. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand.	—	—	—	5 $\frac{3}{8}$
	15-1.3 <sup>l, m</sup>	2" × 4" wood studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of studs) on the exterior surface with interior surface treatment as required for interior wood stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand.	—	—	—	Varies
	15-1.4	3 $\frac{5}{8}$ " No. 16 gage noncombustible studs 16" on center with $\frac{7}{8}$ " cement plaster (measured from the face of the studs) on the exterior surface with interior surface treatment as required for interior, nonbearing, noncombustible stud partitions in this table. Plaster mix 1:4 for scratch coat and 1:5 for brown coat, by volume, cement to sand.	—	—	—	Varies <sup>d</sup>
	15-1.5 <sup>m</sup>	2 $\frac{5}{8}$ " × 3 $\frac{3}{4}$ " clay face brick with cored holes over $\frac{1}{2}$ " gypsum sheathing on exterior surface of 2" × 4" wood studs at 16" on center and two layers $\frac{5}{8}$ " Type X gypsum wallboard <sup>e</sup> on interior surface. Sheathing placed horizontally or vertically with vertical joints over studs nailed 6" on center with 1 $\frac{3}{4}$ " × No. 11 gage by $\frac{7}{16}$ " head galvanized nails. Inner layer of wallboard placed horizontally or vertically and nailed 8" on center with 6d cooler <sup>n</sup> or wallboard <sup>n</sup> nails. Outer layer of wallboard placed horizontally or vertically and nailed 8" on center with 8d cooler <sup>n</sup> or wallboard <sup>n</sup> nails. All joints staggered with vertical joints over studs. Outer layer joints taped and finished with compound. Nail heads covered with joint compound. 0.035 inch (No. 20 galvanized sheet gage) corrugated galvanized steel wall ties $\frac{3}{4}$ " by 6 $\frac{5}{8}$ " attached to each stud with two 8d cooler <sup>n</sup> or wallboard <sup>n</sup> nails every sixth course of bricks.	—	—	10	—
	15-1.6 <sup>l, m</sup>	2" × 6" fire-retardant-treated wood studs 16" on center. Interior face has two layers of $\frac{5}{8}$ " Type X gypsum with the base layer placed vertically and attached with 6d box nails 12" on center. The face layer is placed horizontally and attached with 8d box nails 8" on center at joints and 12" on center elsewhere. The exterior face has a base layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by self-furred exterior lath attached with 2 $\frac{1}{2}$ ", No. 12 gage galvanized roofing nails with a $\frac{3}{8}$ " diameter head and spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " brown coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat.	—	—	8 $\frac{1}{4}$	—
	15-1.7 <sup>l, m</sup>	2" × 6" wood studs 16" on center. The exterior face has a layer of $\frac{5}{8}$ " Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1" by No. 18 gage self-furred exterior lath attached with 8d by 2 $\frac{1}{2}$ " long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a $\frac{1}{2}$ " scratch coat, a bonding agent and a $\frac{1}{2}$ " brown coat is then applied. The scratch coat is mixed in the proportion of 1:3 by weight, cement to sand with 10 pounds of hydrated lime and 3 pounds of approved additives or admixtures per sack of cement. The brown coat is mixed in the proportion of 1:4 by weight, cement to sand with the same amounts of hydrated lime and approved additives or admixtures used in the scratch coat. The interior is covered with $\frac{3}{8}$ " gypsum lath with 1" hexagonal mesh of 0.035 inch (No. 20 B.W. gage) woven wire lath furred out $\frac{5}{16}$ " and 1" perlite or vermiculite gypsum plaster. Lath nailed with 1 $\frac{1}{8}$ " by No. 13 gage by $\frac{19}{64}$ " head plasterboard glued nails spaced 5" on center. Mesh attached by 1 $\frac{3}{4}$ " by No. 12 gage by $\frac{3}{8}$ " head nails with $\frac{3}{8}$ " furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to 2 $\frac{1}{2}$ cubic feet of aggregate.	—	—	8 $\frac{3}{8}$	—

(continued)

**TABLE 720.1(2) —continued**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS** <sup>a, o, p</sup>

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
15. Exterior or interior walls (continued)	15-1.8 <sup>l, m</sup>	2" × 6" wood studs 16" on center. The exterior face has a layer of 5/8" Type X gypsum sheathing placed vertically with 6d box nails 8" on center at joints and 12" on center elsewhere. An approved building paper is next applied, followed by 1 1/2" by No. 17 gage self-furred exterior lath attached with 8d by 2 1/2" long galvanized roofing nails spaced 6" on center along each stud. Cement plaster consisting of a 1/2" scratch coat, and a 1/2" brown coat is then applied. The plaster may be placed by machine. The scratch coat is mixed in the proportion of 1:4 by weight, plastic cement to sand. The brown coat is mixed in the proportion of 1:5 by weight, plastic cement to sand. The interior is covered with 3/8" gypsum lath with 1" hexagonal mesh of No. 20 gage woven wire lath furred out 5/16" and 1" perlite or vermiculite gypsum plaster. Lath nailed with 1 1/8" by No. 13 gage by 19/64" head plasterboard glued nails spaced 5" on center. Mesh attached by 1 3/4" by No. 12 gage by 3/8" head nails with 3/8" furrings, spaced 8" on center. The plaster mix shall not exceed 100 pounds of gypsum to 2 1/2 cubic feet of aggregate.	—	—	8 3/8	—
	15-1.9	4" No. 18 gage, nonload-bearing metal studs, 16" on center, with 1" portland cement lime plaster (measured from the back side of the 3/4-pound expanded metal lath) on the exterior surface. Interior surface to be covered with 1" of gypsum plaster on 3/4-pound expanded metal lath proportioned by weight—1:2 for scratch coat, 1:3 for brown, gypsum to sand. Lath on one side of the partition fastened to 1/4" diameter pencil rods supported by No. 20 gage metal clips, located 16" on center vertically, on each stud. 3" thick mineral fiber insulating batts friction fitted between the studs.	—	—	6 1/2 <sup>d</sup>	—
	15-1.10	Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, with 1/2" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two 1/2"-long flare-bevel welds, and 4" foot attached to the GFRC skin with 5/8" thick GFRC bonding pads that extend 2 1/2" beyond the flex anchor foot on both sides. Interior surface to have two layers of 1/2" Type X gypsum wallboard. <sup>e</sup> The first layer of wallboard to be attached with 1"-long Type S buglehead screws spaced 24" on center and the second layer is attached with 1 5/8"-long Type S screws spaced at 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has 1 1/2" returns packed with mineral fiber and caulked on the exterior.	—	—	6 1/2	—
	15-1.11	Steel studs 0.060" thick, 4" deep or 6" at 16" or 24" centers, respectively, with 1/2" Glass Fiber Reinforced Concrete (GFRC) on the exterior surface. GFRC is attached with flex anchors at 24" on center, with 5" leg welded to studs with two 1/2"-long flare-bevel welds, and 4" foot attached to the GFRC skin with 5/8"-thick GFRC bonding pads that extend 2 1/2" beyond the flex anchor foot on both sides. Interior surface to have one layer of 5/8" Type X gypsum wallboard <sup>e</sup> , attached with 1 1/4"-long Type S buglehead screws spaced 12" on center. Cavity is to be filled with 5" of 4 pcf (nominal) mineral fiber batts. GFRC has 1 1/2" returns packed with mineral fiber and caulked on the exterior.	—	—	—	6 1/8
	15-1.12 <sup>q</sup>	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 1/4" Type S drywall screws, spaced 12" on center. Cavity to be filled with 5 1/2" mineral wool insulation.	—	—	—	6 3/4
	15-1.13 <sup>q</sup>	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4" wide, applied vertically with all joints over framing or blocking, and fastened with 2 1/4" Type S drywall screws, spaced 12" on center. R-19 fiberglass insulation installed in stud cavity.	—	—	—	6 3/4
	15-1.14 <sup>q</sup>	2" × 6" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 1/4" Type S drywall screws, spaced 7" on center.	—	—	—	6 3/4
	15-1.15 <sup>q</sup>	2" × 4" wood studs at 16" with double top plates, single bottom plate; interior and exterior sides covered with 5/8" Type X gypsum wallboard and sheathing, respectively, 4" wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 1/4" Type S drywall screws, spaced 12" on center. Cavity to be filled with 3 1/2" mineral wool insulation.	—	—	—	4 3/4

(continued)



**TABLE 720.1(2) —continued**  
**RATED FIRE-RESISTANCE PERIODS FOR VARIOUS WALLS AND PARTITIONS** <sup>a, o, p</sup>

MATERIAL	ITEM NUMBER	CONSTRUCTION	MINIMUM FINISHED THICKNESS FACE-TO-FACE <sup>b</sup> (inches)			
			4 hour	3 hour	2 hour	1 hour
15. Exterior or interior walls (continued)	15-1.16 <sup>a</sup>	2" x 6" wood studs at 24" centers with double top plates, single bottom plate; interior and exterior side covered with two layers of 5/8" Type X gypsum wallboard, 4" wide, applied horizontally with vertical joints over studs. Base layer fastened with 2 1/4" Type S drywall screws, spaced 24" on center, and face layer fastened with Type S drywall screws, spaced 8" on center, wallboard joints covered with paper tape and joint compound, fastened heads covered with joint compound. Cavity to be filled with 5 1/2" mineral wool insulation.	—	—	7 3/4	—
	15-2.1 <sup>d</sup>	3 5/8" No. 16 gage steel studs at 24" on center or 2" x 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum 3/4" thick portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C 1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the portland cement plaster, mortar and thin veneer brick units shall be not less than 1 3/4". Interior side covered with one layer of 5/8" thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center.	—	—	—	6
	15-2.2 <sup>d</sup>	3 5/8" No. 16 gage steel studs at 24" on center or 2" x 4" wood studs at 24" on center. Metal lath attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center and covered with minimum 3/4" thick portland cement plaster. Thin veneer brick units of clay or shale complying with ASTM C 1088, Grade TBS or better, installed in running bond in accordance with Section 1405.10. Combined total thickness of the portland cement plaster, mortar and thin veneer brick units shall be not less than 2". Interior side covered with two layers of 5/8" thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with 1 5/8" long No. 6 drywall screws at 12" on center.	—	—	6 7/8	—
	15-2.3 <sup>d</sup>	3 5/8" No. 16 gage steel studs at 16" on center or 2" x 4" wood studs at 16" on center. Where metal lath is used, attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than 2 5/8" thick complying with ASTM C 216 installed in accordance with Section 1405.6 with a minimum 1" air space. Interior side covered with one layer of 5/8" thick Type X gypsum wallboard attached to studs with 1" long No. 6 drywall screws at 12" on center.	—	—	—	7 7/8
	15-2.4 <sup>d</sup>	3 5/8" No. 16 gage steel studs at 16" on center or 2" x 4" wood studs at 16" on center. Where metal lath is used, attached to the exterior side of studs with minimum 1" long No. 6 drywall screws at 6" on center. Brick units of clay or shale not less than 2 5/8" thick complying with ASTM C 216 installed in accordance with Section 1405.6 with a minimum 1" air space. Interior side covered with two layers of 5/8" thick Type X gypsum wallboard. Bottom layer attached to studs with 1" long No. 6 drywall screws at 24" on center. Top layer attached to studs with 1 5/8" long No. 6 drywall screws at 12" on center.	—	—	8 1/2	—
16. Exterior walls rated for fire resistance from the inside only in accordance with Section 704.5.	16-1.1 <sup>a</sup>	2" x 4" wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally unblocked, and fastened with 2 1/4" Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound. Exterior covered with 3/8" wood structural panels (oriented strand board), applied vertically, horizontal joints blocked and fastened with 6d common nails (bright) — 12" on center in the field, and 6" on center panel edges. Cavity to be filled with 3 1/2" mineral wool insulation. Rating established for exposure from interior side only.	—	—	—	4 1/2
	16-1.2 <sup>a</sup>	2" x 6 1/2" (51 mm x 152 mm) wood studs at 16" centers with double top plates, single bottom plate; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied horizontally or vertically with vertical joints over studs and fastened with 2 1/4" Type S drywall screws, spaced 12" on center, wallboard joints covered with paper tape and joint compound, fastener heads covered with joint compound, exterior side covered with 7/16" wood structural panels (oriented strand board) fastened with 6d common nails (bright) spaced 12" on center in the field and 6" on center along the panel edges. Cavity to be filled with 5 1/2" mineral wool insulation. Rating established from the gypsum-covered side only.	—	—	—	6 9/16
	16-1.3	2" x 6" wood studs at 16" centers with double top plates, single bottom plates; interior side covered with 5/8" Type X gypsum wallboard, 4" wide, applied vertically with all joints over framing or blocking and fastened with 2 1/4" Type S drywall screws spaced 7" on center. Joints to be covered with tape and joint compound. Exterior covered with 3/8" wood structural panels, applied vertically with edges over framing or blocking and fastened with 6d common nails (bright) at 12" on center in the field and 6" on center on panel edges. R-19 mineral fiber insulation installed in stud cavity. Rating established from the gypsum-covered side only.	—	—	—	6 1/2

For SI: 1 inch = 25.4 mm, 1 square inch = 645.2 mm<sup>2</sup>, 1 cubic foot = 0.0283 m<sup>3</sup>.

a. Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.

(continued)

**Table 720.1 (2) Notes—continued**

- b. Thickness shown for brick and clay tile are nominal thicknesses unless plastered, in which case thicknesses are net. Thickness shown for concrete masonry and clay masonry is equivalent thickness defined in Section 721.3.1 for concrete masonry and Section 721.4.1 for clay masonry. Where all cells are solid grouted or filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, the equivalent thickness shall be the thickness of the block or brick using specified dimensions as defined in Chapter 21. Equivalent thickness may also include the thickness of applied plaster and lath or gypsum wallboard, where specified.
- c. For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is at least 75 percent of the gross cross-sectional area measured in the same plane.
- d. Shall be used for nonbearing purposes only.
- e. For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with a minimum of  $1/16$ -inch gypsum veneer plaster.
- f. The fire-resistance time period for concrete masonry units meeting the equivalent thicknesses required for a 2-hour fire-resistance rating in Item 3, and having a thickness of not less than  $7\frac{5}{8}$  inches is 4 hours when cores which are not grouted are filled with silicone-treated perlite loose-fill insulation; vermiculite loose-fill insulation; or expanded clay, shale or slate lightweight aggregate, sand or slag having a maximum particle size of  $3/8$  inch.
- g. The fire-resistance rating of concrete masonry units composed of a combination of aggregate types or where plaster is applied directly to the concrete masonry shall be determined in accordance with ACI 216.1/TMS 216. Lightweight aggregates shall have a maximum combined density of 65 pounds per cubic foot.
- h. See also Note b. The equivalent thickness shall be permitted to include the thickness of cement plaster or 1.5 times the thickness of gypsum plaster applied in accordance with the requirements of Chapter 25.
- i. Concrete walls shall be reinforced with horizontal and vertical temperature reinforcement as required by Chapter 19.
- j. Studs are welded truss wire studs with 0.18 inch (No. 7 B.W. gage) flange wire and 0.18 inch (No. 7 B.W. gage) truss wires.
- k. Nailable metal studs consist of two channel studs spot welded back to back with a crimped web forming a nailing groove.
- l. Wood structural panels shall be permitted to be installed between the fire protection and the wood studs on either the interior or exterior side of the wood frame assemblies in this table, provided the length of the fasteners used to attach the fire protection is  $\frac{1}{4}$  increased by an amount at least equal to the thickness of the wood structural panel.
- m. The design stress of studs shall be reduced to 78 percent of allowable  $F'_c$  with the maximum not greater than 78 percent of the calculated stress with studs having a slenderness ratio  $l/d$  of 33.
- n. For properties of cooler or wallboard nails, see ASTM C 514, ASTM C 547 or ASTM F 1667.
- o. Generic fire-resistance ratings (those not designated as PROPRIETARY\* in the listing) in the GA 600 shall be accepted as if herein listed.
- p. NCMA TEK 5-8, shall be permitted for the design of fire walls.
- q. The design stress of studs shall be equal to a maximum of 100 percent of the allowable  $F'_c$  calculated in accordance with Section 2306.

**TABLE 720.1(3)**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
1. Siliceous aggregate concrete	1-1.1	Slab (no ceiling required). Minimum cover over nonprestressed reinforcement shall not be less than $3/4$ inch. <sup>b</sup>	7.0	6.2	5.0	3.5	—	—	—	—
2. Carbonate aggregate concrete	2-1.1		6.6	5.7	4.6	3.2	—	—	—	—
3. Sand-lightweight concrete	3-1.1		5.4	4.6	3.8	2.7	—	—	—	—
4. Lightweight concrete	4-1.1		5.1	4.4	3.6	2.5	—	—	—	—
5. Reinforced concrete	5-1.1	Slab with suspended ceiling of vermiculite gypsum plaster over metal lath attached to $3/4$ " cold-rolled channels spaced 12" on center. Ceiling located 6" minimum below joists.	3	2	—	—	1	$3/4$	—	—
	5-2.1	$3/8$ " Type X gypsum wallboard <sup>c</sup> attached to 0.018 inch (No. 25 carbon sheet steel gage) by $7/8$ " deep by $2\frac{5}{8}$ " hat-shaped galvanized steel channels with 1"-long No. 6 screws. The channels are spaced 24" on center, span 35" and are supported along their length at 35" intervals by 0.033-inch (No. 21 galvanized sheet gage) galvanized steel flat strap hangers having formed edges that engage the lips of the channel. The strap hangers are attached to the side of the concrete joists with $5/32$ " by $1\frac{1}{4}$ " long power-driven fasteners. The wallboard is installed with the long dimension perpendicular to the channels. All end joints occur on channels and supplementary channels are installed parallel to the main channels, 12" each side, at end joint occurrences. The finished ceiling is located approximately 12" below the soffit of the floor slab.	—	—	$2\frac{1}{2}$	—	—	$5/8$	—	—

(continued)

**TABLE 720.1(3) —continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
6. Steel joists constructed with a poured reinforced concrete slab on metal lath forms or steel form units <sup>d, e</sup>	6-1.1	Gypsum plaster on metal lath attached to the bottom cord with single No. 16 gage or doubled No. 18 gage wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 2-hour system. For 3-hour system plaster is neat.	—	—	2½	2¼	—	—	¾	⅝
	6-2.1	Vermiculite gypsum plaster on metal lath attached to the bottom chord with single No. 16 gage or doubled 0.049-inch (No. 18 B.W. gage) wire ties 6" on center.	—	2	—	—	—	⅝	—	—
	6-3.1	Cement plaster over metal lath attached to the bottom chord of joists with single No. 16 gage or doubled 0.049-inch (No. 18 B.W. gage) wire ties spaced 6" on center. Plaster mixed 1:2 for scratch coat, 1:3 for brown coat for 1-hour system and 1:1 for scratch coat, 1:1½ for brown coat for 2-hour system, by weight, cement to sand.	—	—	—	2	—	—	—	⅝ <sup>f</sup>
	6-4.1	Ceiling of ⅝" Type X wallboard <sup>c</sup> attached to ⅞" deep by 2⅝" by 0.02 1 inch (No. 25 carbon sheet steel gage) hat-shaped furring channels 12" on center with 1" long No. 6 wallboard screws at 8" on center. Channels wire tied to bottom chord of joists with doubled 0.049 inch (No. 18 B.W. gage) wire or suspended below joists on wire hangers. <sup>g</sup>	—	—	2½	—	—	—	⅝	—
	6-5.1	Wood-fibered gypsum plaster mixed 1:1 by weight gypsum to sand aggregate applied over metal lath. Lath tied 6" on center to ¾" channels spaced 13½" on center. Channels secured to joists at each intersection with two strands of 0.049 inch (No. 18 B.W. gage) galvanized wire.	—	—	2½	—	—	—	¾	—
7. Reinforced concrete slabs and joists with hollow clay tile fillers laid end to end in rows 2½" or more apart; reinforcement placed between rows and concrete cast around and over tile.	7-1.1	⅝" gypsum plaster on bottom of floor or roof construction.	—	—	8 <sup>h</sup>	—	—	—	⅝	—
	7-1.2	None	—	—	—	5½ <sup>i</sup>	—	—	—	—
8. Steel joists constructed with a reinforced concrete slab on top poured on a ½" deep steel deck. <sup>e</sup>	8-1.1	Vermiculite gypsum plaster on metal lath attached to ¾" cold-rolled channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center.	2½ <sup>i</sup>	—	—	—	¾	—	—	—
9. 3" deep cellular steel deck with concrete slab on top. Slab thickness measured to top.	9-1.1	Suspended ceiling of vermiculite gypsum plaster base coat and vermiculite acoustical plaster on metal lath attached at 6" intervals to ¾" cold-rolled channels spaced 12" on center and secured to 1½" cold-rolled channels spaced 36" on center with 0.065" (No. 16 B.W. gage) wire. 1½" channels supported by No. 8 gage wire hangers at 36" on center. Beams within envelope and with a 2½" airspace between beam soffit and lath have a 4-hour rating.	2½	—	—	—	1⅛ <sup>k</sup>	—	—	—
10. 1½"-deep steel roof deck on steel framing. Insulation board, 30 pcf density, composed of wood fibers with cement binders of thickness shown bonded to deck with unified asphalt adhesive. Covered with a Class A or B roof covering.	10-1.1	Ceiling of gypsum plaster on metal lath. Lath attached to ¾" furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. ¾" channel saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle-tied with 0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate.	—	—	1⅞	1	—	—	¾ <sup>l</sup>	¾ <sup>l</sup>

(continued)

**TABLE 720.1(3)—continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
11. 1½"-deep steel roof deck on steel-framing wood fiber insulation board, 17.5 pcf density on top applied over a 15-lb asphalt-saturated felt. Class A or B roof covering.	11-1.1	Ceiling of gypsum plaster on metal lath. Lath attached to ¾" furring channels with 0.049" (No. 18 B.W. gage) wire ties spaced 6" on center. ¾" channels saddle tied to 2" channels with doubled 0.065" (No. 16 B.W. gage) wire ties. 2" channels spaced 36" on center suspended 2" below steel framing and saddle tied with 0.165" (No. 8 B.W. gage) wire. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, gypsum-to-sand aggregate for 1-hour system. For 2-hour system, plaster mix is 1:2 by weight, gypsum-to-sand aggregate.	—	—	1½	1	—	—	7/8	¾
12. 1½" deep steel roof deck on steel-framing insulation of rigid board consisting of expanded perlite and fibers impregnated with integral asphalt waterproofing; density 9 to 12 pcf secured to metal roof deck by ½" wide ribbons of waterproof, cold-process liquid adhesive spaced 6" apart. Steel joist or light steel construction with metal roof deck, insulation, and Class A or B built-up roof covering. <sup>c</sup>	12-1.1	Gypsum-vermiculite plaster on metal lath wire tied at 6" intervals to ¾" furring channels spaced 12" on center and wire tied to 2" runner channels spaced 32" on center. Runners wire tied to bottom chord of steel joists.	—	—	1	—	—	—	7/8	—
13. Double wood floor over wood joists spaced 16" on center. <sup>m,n</sup>	13-1.1	Gypsum plaster over ⅜" Type X gypsum lath. Lath initially applied with not less than four 1⅛" by No. 13 gage by 19/64" head plasterboard blued nails per bearing. Continuous stripping over lath along all joist lines. Stripping consists of 3" wide strips of metal lath attached by 1½" by No. 11 gage by ½" head roofing nails spaced 6" on center. Alternate stripping consists of 3" wide 0.049" diameter wire stripping weighing 1 pound per square yard and attached by No.16 gage by 1½" by ¾" crown width staples, spaced 4" on center. Where alternate stripping is used, the lath nailing may consist of two nails at each end and one nail at each intermediate bearing. Plaster mixed 1:2 by weight, gypsum-to-sand aggregate.	—	—	—	—	—	—	—	7/8
	13-1.2	Cement or gypsum plaster on metal lath. Lath fastened with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center. Plaster mixed 1:2 for scratch coat and 1:3 for brown coat, by weight, cement to sand aggregate.	—	—	—	—	—	—	—	5/8
	13-1.3	Perlite or vermiculite gypsum plaster on metal lath secured to joists with 1½" by No. 11 gage by 7/16" head barbed shank roofing nails spaced 5" on center.	—	—	—	—	—	—	—	5/8
	13-1.4	½" Type X gypsum wallboard <sup>c</sup> nailed to joists with 5d cooler <sup>o</sup> or wallboard <sup>o</sup> nails at 6" on center. End joints of wallboard centered on joists.	—	—	—	—	—	—	—	1/2
14. Plywood stressed skin panels consisting of ⅝"-thick interior C-D (exterior glue) top stressed skin on 2" × 6" nominal (minimum) stringers. Adjacent panel edges joined with 8d common wire nails spaced 6" on center. Stringers spaced 12" maximum on center.	14-1.1	½"-thick wood fiberboard weighing 15 to 18 pounds per cubic foot installed with long dimension parallel to stringers or ⅜" C-D (exterior glue) plywood glued and/or nailed to stringers. Nailing to be with 5d cooler <sup>o</sup> or wallboard <sup>o</sup> nails at 12" on center. Second layer of ½" Type X gypsum wallboard <sup>c</sup> applied with long dimension perpendicular to joists and attached with 8d cooler <sup>o</sup> or wallboard <sup>o</sup> nails at 6" on center at end joints and 8" on center elsewhere. Wallboard joints staggered with respect to fiberboard joints.	—	—	—	—	—	—	—	1

(continued)



**TABLE 720.1(3)—continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
15. Vermiculite concrete slab proportioned 1:4 (portland cement to vermiculite aggregate) on a 1½"-deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019 inch (No. 26 carbon steel sheet gage) or greater. Slab reinforced with 4"× 8" 0.109/0.083" (No. 12/14 B.W. gage) welded wire mesh.	15-1.1	None.	—	—	—	3 <sup>i</sup>	—	—	—	—
16. Perlite concrete slab proportioned 1:6 (portland cement to perlite aggregate) on a 1¼"-deep steel deck supported on individually protected steel framing. Slab reinforced with 4"× 8" 0.109/0.083" (No. 12/14 B.W. gage) welded wire mesh.	16-1.1	None.	—	—	—	3½ <sup>j</sup>	—	—	—	—
17. Perlite concrete slab proportioned 1:6 (portland cement to perlite aggregate) on a 9/16"-deep steel deck supported by steel joists 4" on center. Class A or B roof covering on top.	17-1.1	Perlite gypsum plaster on metal lath wire tied to ¾" furring channels attached with 0.065-inch (No. 16 B.W. gage) wire ties to lower chord of joists.	—	2 <sup>p</sup>	2 <sup>p</sup>	—	—	7/8	¾	—
18. Perlite concrete slab proportioned 1:6 (portland cement to perlite aggregate) on 1¼"-deep steel deck supported on individually protected steel framing. Maximum span of deck 6'-10" where deck is less than 0.019"(No. 26 carbon sheet steel gage) and 8'-0" where deck is 0.019"(No. 26 carbon sheet steel gage) or greater. Slab reinforced with 0.042" (No. 19 B.W. gage) hexagonal wire mesh. Class A or B roof covering on top.	18-1.1	None.	—	2¼ <sup>p</sup>	2¼ <sup>p</sup>	—	—	—	—	—
19. Floor and beam construction consisting of 3"-deep cellular steel floor unit mounted on steel members with 1:4 (proportion of portland cement to perlite aggregate) perlite-concrete floor slab on top.	19-1.1	Suspended envelope ceiling of perlite gypsum plaster on metal lath attached to ¾" cold-rolled channels, secured to 1½" cold-rolled channels spaced 42" on center supported by 0.203 inch (No. 6 B.W. gage) wire 36" on center. Beams in envelope with 3" minimum airspace between beam soffit and lath have a 4-hour rating.	2 <sup>p</sup>	—	—	—	1 <sup>l</sup>	—	—	—

(continued)

**TABLE 720.1(3) —continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
20. Perlite concrete proportioned 1:6 (portland cement to perlite aggregate) poured to 1/8-inch thickness above top of corrugations of 1 3/16"-deep galvanized steel deck maximum span 8'-0" for 0.024-inch (No. 24 galvanized sheet gage) or 6' 0" for 0.019-inch (No. 26 galvanized sheet gage) with deck supported by individually protected steel framing. Approved polystyrene foam plastic insulation board having a flame spread not exceeding 75 (1" to 4" thickness) with vent holes that approximate 3 percent of the board surface area placed on top of perlite slurry. A 2" by 4" insulation board contains six 2 3/4" diameter holes. Board covered with 2 1/4" minimum perlite concrete slab. Slab reinforced with mesh consisting of 0.042 inch (No. 19 B.W. gage) galvanized steel wire twisted together to form 2" hexagons with straight 0.065 inch (No. 16 B.W. gage) galvanized steel wire woven into mesh and spaced 3". Alternate slab reinforcement shall be permitted to consist of 4" x 8", 0.109/0.238-inch (No. 12/4 B.W. gage), or 2" x 2", 0.083/0.083-inch (No. 14/14 B.W. gage) welded wire fabric. Class A or B roof covering on top.	20-1.1	None.	—	—	Varies	—	—	—	—	—
21. Wood joists, wood I-joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1/2" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with 8d nails. The wood structural panel thickness shall not be less than nominal 1/2" nor less than required by Chapter 23.	21-1.1	Base layer 5/8" Type X gypsum wallboard applied at right angles to joist or truss 24" o.c. with 1 1/4" Type S or Type W drywall screws 24" o.c. Face layer 5/8" Type X gypsum wallboard or veneer base applied at right angles to joist or truss through base layer with 1 7/8" Type S or Type W drywall screws 12" o.c. at joints and intermediate joist or truss. Face layer Type G drywall screws placed 2" back on either side of face layer end joints, 12" o.c.	—	—	—	Varies	—	—	—	1 1/4
22. Steel joists, floor trusses and flat or pitched roof trusses spaced a maximum 24" o.c. with 1/2" wood structural panels with exterior glue applied at right angles to top of joist or top chord of trusses with No. 8 screws. The wood structural panel thickness shall not be less than nominal 1/2" nor less than required by Chapter 23.	22-1.1	Base layer 5/8" Type X gypsum board applied at right angles to steel framing 24" on center with 1" Type S drywall screws spaced 24" on center. Face layer 5/8" Type X gypsum board applied at right angles to steel framing attached through base layer with 1 5/8" Type S drywall screws 12" on center at end joints and intermediate joints and 1 1/2" Type G drywall screws 12 inches on center placed 2" back on either side of face layer end joints. Joints of the face layer are offset 24" from the joints of the base layer.	—	—	—	Varies	—	—	—	1 1/4

(continued)

**TABLE 720.1(3) —continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
23. Wood I-joist (minimum joist depth 9 <sup>1</sup> / <sub>4</sub> " with a minimum flange depth of 1 <sup>5</sup> / <sub>16</sub> " and a minimum flange cross-sectional area of 2.3 square inches) at 24" o.c. spacing with 1 inch $\times$ 4 inch $\pm$ (nominal) wood furring strip spacer applied parallel to and covering the bottom of the bottom flange of each member, tacked in place. 2" mineral fiber insulation, 3.5 pcf (nominal) installed adjacent to the bottom flange of the I-joist and supported by the 1" $\times$ 4" furring strip spacer.	23-1.1	1/2" deep single leg resilient channel 16" on center (channels doubled at wallboard end joints), placed perpendicular to the furring strip and joist and attached to each joist by 1 <sup>7</sup> / <sub>8</sub> " Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered at least 4" and fastened with 1 <sup>1</sup> / <sub>8</sub> " Type S drywall screws spaced 7" on center. Wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	—
24. Wood I-joist (minimum I-joist depth 9 <sup>1</sup> / <sub>4</sub> " with a minimum flange depth of 1 <sup>1</sup> / <sub>2</sub> " and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of 3/8") @ 24" o.c., 1 <sup>1</sup> / <sub>2</sub> " mineral wool insulation (2.5 pcf – nominal) resting on hat-shaped furring channels.	24-1.1	Minimum 0.026" thick hat-shaped channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 <sup>5</sup> / <sub>8</sub> " Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with 1 <sup>1</sup> / <sub>8</sub> " Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	5/8
25. Wood I-joist (minimum I-joist depth 9 <sup>1</sup> / <sub>4</sub> " with a minimum flange depth of 1 <sup>1</sup> / <sub>2</sub> " and a minimum flange cross-sectional area of 5.25 square inches; minimum web thickness of 7/16") @ 24" o.c., 1 <sup>1</sup> / <sub>2</sub> " mineral wool insulation (2.5 pcf – nominal) resting on resilient channels.	25-1.1	Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1 <sup>5</sup> / <sub>8</sub> " Type S drywall screws. 5/8" Type C gypsum wallboard applied perpendicular to the channel with end joints staggered and fastened with 1" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. at the wallboard ends. Wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	5/8
26. Wood I-joist (minimum I-joist depth 9 <sup>1</sup> / <sub>4</sub> " with a minimum flange thickness of 1 <sup>1</sup> / <sub>2</sub> " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of 3/8") @ 24" o.c.	26-1.1	Two layers of 1/2" Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with 1 <sup>5</sup> / <sub>8</sub> " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 2" Type S drywall screws spaced 12" o.c. in the field and 8" o.c. on the edges. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 <sup>1</sup> / <sub>2</sub> " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	1
27. Wood I-joist (minimum I-joist depth 9 <sup>1</sup> / <sub>2</sub> " with a minimum flange depth of 1 <sup>5</sup> / <sub>16</sub> " and a minimum flange cross-sectional area of 1.95 square inches; minimum web thickness of 3/8") @ 24" o.c.	27-1.1	Minimum 0.019" thick resilient channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1" Type S drywall screws. Two layers of 1/2" Type X gypsum wallboard applied with the long dimension perpendicular to the I-joists with end joints staggered. The base layer is fastened with 1 <sup>1</sup> / <sub>8</sub> " Type S drywall screws spaced 12" o.c. and the face layer is fastened with 1" Type S drywall screws spaced 12" o.c. Face layer end joints shall not occur on the same I-joist as base layer end joints and edge joints shall be offset 24" from base layer joints. Face layer to also be attached to base layer with 1 <sup>1</sup> / <sub>2</sub> " Type G drywall screws spaced 8" o.c. placed 6" from face layer end joints. Face layer wallboard joints to be taped and covered with joint compound.	—	—	—	Varies	—	—	—	1

(continued)

**TABLE 720.1(3)—continued**  
**MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS<sup>a, q</sup>**

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
28. Wood I-joist (minimum I-joist depth 9 $\frac{1}{2}$ " with a minimum flange depth of 1 $\frac{1}{2}$ " and a minimum flange cross-sectional area of 2.25 square inches; minimum web thickness of $\frac{3}{8}$ ") @ 24" o.c. Unfaced fiberglass insulation is installed between the I-joists supported on the upper surface of the flange by stay wires spaced 12" o.c.	28-1.1	Base layer of $\frac{5}{8}$ " Type C gypsum wallboard attached directly to I-joists with 1" Type S drywall screws spaced 12" o.c. with ends staggered. Minimum 0.0179" thick hat-shaped $\frac{7}{8}$ -inch furring channel 16" o.c. (channels doubled at wallboard end joints), placed perpendicular to the joist and attached to each joist by 1" Type S drywall screws after the base layer of gypsum wallboard has been applied. The middle and face layers of $\frac{5}{8}$ " Type C gypsum wallboard applied perpendicular to the channel with end joints staggered. The middle layer is fastened with 1" Type S drywall screws spaced 12" o.c. The face layer is applied parallel to the middle layer but with the edge joints offset 24" from those of the middle layer and fastened with 1" Type S drywall screws 8" o.c. The joints shall be taped and covered with joint compound.	—	—	—	Varies	—	—	2 $\frac{3}{4}$	—
29. Channel-shaped 18 gage steel joists (minimum depth 8") spaced a maximum 24" o.c. supporting tongue-and-groove wood structural panels (nominal minimum $\frac{3}{4}$ " thick) applied perpendicular to framing members. Structural panels attached with 1" Type S-12 screws spaced 12" o.c.	29-1.1	Base layer $\frac{5}{8}$ " Type X gypsum board applied perpendicular to bottom of framing members with 1" Type S-12 screws spaced 12" o.c. Second layer $\frac{5}{8}$ " Type X gypsum board attached perpendicular to framing members with 1" Type S-12 screws spaced 12" o.c. Second layer joints offset 24" from base layer. Third layer $\frac{5}{8}$ " Type X gypsum board attached perpendicular to framing members with 2" Type S-12 screws spaced 12" o.c. Third layer joints offset 12" from second layer joints. Hat-shaped $\frac{7}{8}$ -inch rigid furring channels applied at right angles to framing members over third layer with two 2" Type S-12 screws at each framing member. Face layer $\frac{5}{8}$ " Type X gypsum board applied at right angles to furring channels with 1" Type S screws spaced 12" o.c.	—	—	Varies	—	—	—	3 $\frac{3}{8}$	—

**Table 720.1(3) Notes.**

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 0.454 kg, 1 cubic foot = 0.0283m<sup>3</sup>,  
1 pound per square inch = 6.895 kPa = 1 pound per lineal foot = 1.4882 kg/m.

- Staples with equivalent holding power and penetration shall be permitted to be used as alternate fasteners to nails for attachment to wood framing.
- When the slab is in an unrestrained condition, minimum reinforcement cover shall not be less than 1 $\frac{5}{8}$  inches for 4-hour (siliceous aggregate only); 1 $\frac{1}{4}$  inches for 4- and 3-hour; 1 inch for 2-hour (siliceous aggregate only); and  $\frac{3}{4}$  inch for all other restrained and unrestrained conditions.
- For all of the construction with gypsum wallboard described in this table, gypsum base for veneer plaster of the same size, thickness and core type shall be permitted to be substituted for gypsum wallboard, provided attachment is identical to that specified for the wallboard, and the joints on the face layer are reinforced and the entire surface is covered with a minimum of  $\frac{1}{16}$ -inch gypsum veneer plaster.
- Slab thickness over steel joists measured at the joists for metal lath form and at the top of the form for steel form units.
- (a) The maximum allowable stress level for H-Series joists shall not exceed 22,000 psi.  
(b) The allowable stress for K-Series joists shall not exceed 26,000 psi, the nominal depth of such joist shall not be less than 10 inches and the nominal joist weight shall not be less than 5 pounds per lineal foot.
- Cement plaster with 15 pounds of hydrated lime and 3 pounds of approved additives or admixtures per bag of cement.
- Gypsum wallboard ceilings attached to steel framing shall be permitted to be suspended with 1 $\frac{1}{2}$ -inch cold-formed carrying channels spaced 48 inches on center, which are suspended with No.8 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No.18 SWG galvanized wire hangers spaced 48 inches on center. Cross-furring channels are tied to the carrying channels with No. 18 SWG galvanized wire (double strand) and spaced as required for direct attachment to the framing. This alternative is also applicable to those steel framing assemblies recognized under Note q.
- Six-inch hollow clay tile with 2-inch concrete slab above.
- Four-inch hollow clay tile with 1 $\frac{1}{2}$ -inch concrete slab above.
- Thickness measured to bottom of steel form units.
- Five-eighths inch of vermiculite gypsum plaster plus  $\frac{1}{2}$  inch of approved vermiculite acoustical plastic.
- Furring channels spaced 12 inches on center.
- Double wood floor shall be permitted to be either of the following:
  - Subfloor of 1-inch nominal boarding, a layer of asbestos paper weighing not less than 14 pounds per 100 square feet and a layer of 1-inch nominal tongue-and-groove finished flooring; or
  - Subfloor of 1-inch nominal tongue-and-groove boarding or  $\frac{15}{32}$ -inch wood structural panels with exterior glue and a layer of 1-inch nominal tongue-and-groove finished flooring or  $\frac{19}{32}$ -inch wood structural panel finish flooring or a layer of Type I GradeM-1 particleboard not less than  $\frac{5}{8}$ -inch thick.
- The ceiling shall be permitted to be omitted over unusable space, and flooring shall be permitted to be omitted where unusable space occurs above.
- For properties of cooler or wallboard nails, see ASTM C 514, ASTM C 547 or ASTM F 1667.
- Thickness measured on top of steel deck unit.
- Generic fire-resistance ratings (those not designated as PROPRIETARY\* in the listing) in the GA 600 shall be accepted as if herein listed.



## SECTION BC 721 CALCULATED FIRE RESISTANCE

**721.1 General.** The provisions of this section contain procedures by which the fire resistance of specific materials or combinations of materials is established by calculations. These procedures apply only to the information contained in this section and shall not be otherwise used. The calculated fire resistance of concrete, concrete masonry, and clay masonry assemblies shall be permitted in accordance with ACI 216.1/TMS 0216.1. The calculated fire resistance of steel assemblies shall be permitted in accordance with Chapter 5 of ASCE/SEI 29. The calculated fire resistance of exposed wood members and wood decking shall be permitted in accordance with Chapter 16 of ANSI/AF&PA National Design Specification for Wood Construction (NDS).

**721.1.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**CERAMIC FIBER BLANKET.** A mineral wool insulation material made of alumina-silica fibers and weighing 4 to 10 pounds per cubic foot (pcf) (64 to 160 kg/m<sup>3</sup>).

**CONCRETE, CARBONATE AGGREGATE.** Concrete made with aggregates consisting mainly of calcium or magnesium carbonate, such as limestone or dolomite, and containing 40 percent or less quartz, chert, or flint.

**CONCRETE, CELLULAR.** A lightweight insulating concrete made by mixing a preformed foam with portland cement slurry and having a dry unit weight of approximately 30 pcf (480 kg/m<sup>3</sup>).

**CONCRETE, LIGHTWEIGHT AGGREGATE.** Concrete made with aggregates of expanded clay, shale, slag or slate or sintered fly ash or any natural lightweight aggregate meeting ASTM C 330 and possessing equivalent fire-resistance properties and weighing 85 to 115 pcf (1360 to 1840 kg/m<sup>3</sup>).

**CONCRETE, PERLITE.** A lightweight insulating concrete having a dry unit weight of approximately 30 pcf (480 kg/m<sup>3</sup>) made with perlite concrete aggregate. Perlite aggregate is produced from a volcanic rock which, when heated, expands to form a glass-like material of cellular structure.

**CONCRETE, SAND-LIGHTWEIGHT.** Concrete made with a combination of expanded clay, shale, slag, slate, sintered fly ash, or any natural lightweight aggregate meeting ASTM C 330 and possessing equivalent fire-resistance properties and natural sand. Its unit weight is generally between 105 and 120 pcf (1680 and 1920 kg/m<sup>3</sup>).

**CONCRETE, SILICEOUS AGGREGATE.** Concrete made with normal-weight aggregates consisting mainly of silica or compounds other than calcium or magnesium carbonate, which contains more than 40-percent quartz, chert, or flint.

**CONCRETE, VERMICULITE.** A lightweight insulating concrete made with vermiculite concrete aggregate which is laminated micaceous material produced by expanding the ore at high temperatures. When added to a

portland cement slurry the resulting concrete has a dry unit weight of approximately 30 pcf (480 kg/m<sup>3</sup>).

**GLASS FIBERBOARD.** Fibrous glass roof insulation consisting of inorganic glass fibers formed into rigid boards using a binder. The board has a top surface faced with asphalt and kraft reinforced with glass fiber.

**MINERAL BOARD.** A rigid felted thermal insulation board consisting of either felted mineral fiber or cellular beads of expanded aggregate formed into flat rectangular units.

**721.2 Concrete assemblies.** The provisions of this section contain procedures by which the fire-resistance ratings of concrete assemblies are established by calculations.

**721.2.1 Concrete walls.** Cast-in-place and precast concrete walls shall comply with Section 721.2.1.1. Multiwythe concrete walls shall comply with Section 721.2.1.2. Joints between precast panels shall comply with Section 721.2.1.3. Concrete walls with gypsum wallboard or plaster finish shall comply with Section 721.2.1.4.

**721.2.1.1 Cast-in-place or precast walls.** The minimum equivalent thickness of cast-in-place or precast concrete walls for fire-resistance ratings of 1 hour to 4 hours are shown in Table 721.2.1.1. For solid walls with flat vertical surfaces, the equivalent thickness is the same as the actual thickness. The values in Table 721.2.1.1 apply to plain, reinforced or prestressed concrete walls.

**TABLE 721.2.1.1  
MINIMUM EQUIVALENT THICKNESS OF CAST-IN-PLACE  
OR PRECAST CONCRETE WALLS, LOAD-BEARING  
OR NONLOAD-BEARING**

CONCRETE TYPE	MINIMUM SLAB THICKNESS (inches) FOR FIRE-RESISTANCE RATING OF				
	1-hour	1½-hour	2-hour	3-hour	4-hour
Siliceous	3.5	4.3	5.0	6.2	7.0
Carbonate	3.2	4.0	4.6	5.7	6.6
Sand-Lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

For SI: 1 inch = 25.4 mm.

**721.2.1.1.1 Hollow-core precast wall panels.** For hollow-core precast concrete wall panels in which the cores are of constant cross section throughout the length, calculation of the equivalent thickness by dividing the net cross-sectional area (the gross cross section minus the area of the cores) of the panel by its width shall be permitted.

**721.2.1.1.2 Core spaces filled.** Where all of the core spaces of hollow-core wall panels are filled with loose-fill material, such as expanded shale, clay, or slag, or vermiculite or perlite, the fire-resistance rating of the wall is the same as that of a solid wall of the same concrete type and of the same overall thickness.

**721.2.1.1.3 Tapered cross sections.** The thickness of panels with tapered cross sections shall be that determined at a distance  $2t$  or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where  $t$  is the minimum thickness.

**721.2.1.1.4 Ribbed or undulating surfaces.** The equivalent thickness of panels with ribbed or undulating surfaces shall be determined by one of the following expressions:

For  $s \geq 4t$ , the thickness to be used shall be  $t$

For  $s \leq 2t$ , the thickness to be used shall be  $t_e$

For  $4t > s > 2t$ , the thickness to be used shall be

$$t + \left( \frac{4t}{s} - 1 \right) (t_e - t) \quad (\text{Equation 7-3})$$

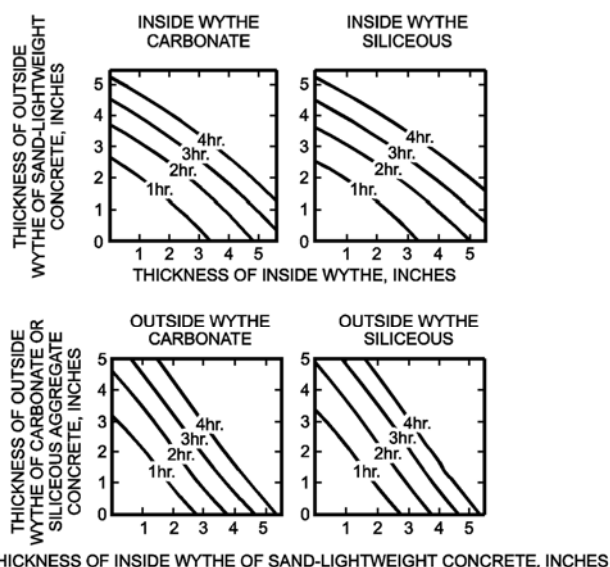
where:

$s$  = Spacing of ribs or undulations.

$t$  = Minimum thickness.

$t_e$  = Equivalent thickness of the panel calculated as the net cross-sectional area of the panel divided by the width, in which the maximum thickness used in the calculation shall not exceed  $2t$ .

**721.2.1.2 Multiwythe walls.** For walls that consist of two wythes of different types of concrete, the fire-resistance ratings shall be permitted to be determined from Figure 721.2.1.2.



For SI: 1 inch = 25.4 mm.

**FIGURE 721.2.1.2  
FIRE-RESISTANCE RATINGS OF  
TWO-WYTHE CONCRETE WALLS**

**721.2.1.2.1 Two or more wythes.** The fire-resistance rating for wall panels consisting of two or more wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7} \quad (\text{Equation 7-4})$$

where:

$R$  = The fire endurance of the assembly, minutes.

$R_1$ ,  $R_2$ , and  $R_n$  = The fire endurances of the individual wythes, minutes. Values of  $R_n^{0.59}$  for use in Equation 7-4 are given in Table 721.2.1.2(1). Calculated fire-resistance ratings are shown in Table 721.2.1.2(2).

**TABLE 721.2.1.2(1)  
VALUES OF  $R_n^{0.59}$  FOR USE IN EQUATION 7-4**

TYPE OF MATERIAL	THICKNESS OF MATERIAL (inches)											
	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7
Siliceous aggregate concrete	5.3	6.5	8.1	9.5	11.3	13.0	14.9	16.9	18.8	20.7	22.8	25.1
Carbonate aggregate concrete	5.5	7.1	8.9	10.4	12.0	14.0	16.2	18.1	20.3	21.9	24.7	27.2 <sup>c</sup>
Sand-lightweight concrete	6.5	8.2	10.5	12.8	15.5	18.1	20.7	23.3	26.0 <sup>c</sup>	Note c	Note c	Note c
Lightweight concrete	6.6	8.8	11.2	13.7	16.5	19.1	21.9	24.7	27.8 <sup>c</sup>	Note c	Note c	Note c
Insulating concrete <sup>a</sup>	9.3	13.3	16.6	18.3	23.1	26.5 <sup>c</sup>	Note c	Note c	Note c	Note c	Note c	Note c
Airspace <sup>b</sup>	—	—	—	—	—	—	—	—	—	—	—	—

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m<sup>3</sup>.

a. Dry unit weight of 35 pcf or less and consisting of cellular, perlite or vermiculite concrete.

b. The  $R_n^{0.59}$  value for one ½" to 3½" airspace is 3.3. The  $R_n^{0.59}$  value for two ½" to 3½" airspaces is 6.7.

c. The fire-resistance rating for this thickness exceeds 4 hours

**TABLE 721.2.1.2(2)**  
**FIRE-RESISTANCE RATINGS BASED ON  $R^{0.59}$**

$R^a$ , MINUTES	$R^{0.59}$
60	11.20
120	16.85
180	21.41
240	25.37

a. Based on Equation 7-4.

**721.2.1.2.2 Foam plastic insulation.** The fire-resistance ratings of precast concrete wall panels consisting of a layer of foam plastic insulation sandwiched between two wythes of concrete shall be permitted to be determined by use of Equation 7-4. Foam plastic insulation with a total thickness of less than 1 inch (25 mm) shall be disregarded. The  $R_n$  value for thickness of foam plastic insulation of 1 inch (25 mm) or greater, for use in the calculation, is 5 minutes; therefore  $R_n^{0.59} = 2.5$ .

**721.2.1.3 Joints between precast wall panels.** Joints between precast concrete wall panels which are not insulated as required by this section shall be considered as openings in walls. Uninsulated joints shall be included in determining the percentage of openings permitted by Table 705.8†. Where openings are not permitted or are required by this code to be protected, the provisions of this section shall be used to determine the amount of joint insulation required. Insulated joints shall not be considered openings for purposes of determining compliance with the allowable percentage of openings in Table 705.8†.

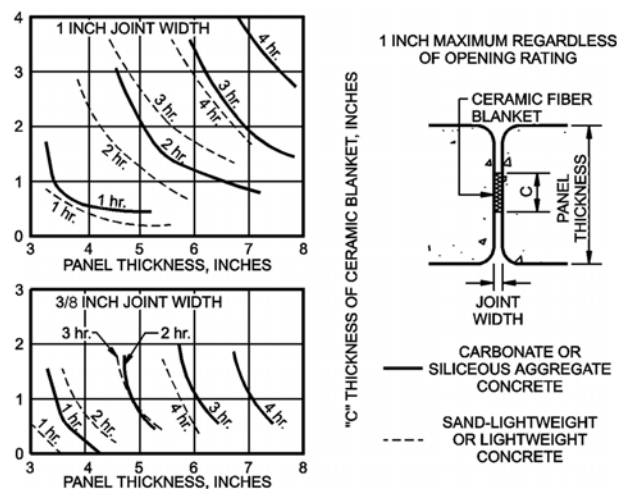
**721.2.1.3.1 Ceramic fiber joint protection.** Figure 721.2.1.3.1 shows thicknesses of ceramic fiber blankets to be used to insulate joints between precast concrete wall panels for various panel thicknesses and for joint widths of  $\frac{3}{8}$  inch (9.5 mm) and

1 inch (25 mm) for fire-resistance ratings of 1 hour to 4 hours. For joint widths between  $\frac{3}{8}$  inch (9.5 mm) and 1 inch (25 mm), the thickness of ceramic fiber blanket is allowed to be determined by direct interpolation. Other tested and labeled materials are acceptable in place of ceramic fiber blankets.

**721.2.1.4 Walls with gypsum wallboard or plaster finishes.** The fire-resistance rating of cast-in-place or precast concrete walls with finishes of gypsum wallboard or plaster applied to one or both sides shall be permitted to be calculated in accordance with the provisions of this section.

**721.2.1.4.1 Nonfire-exposed side.** Where the finish of gypsum wallboard or plaster is applied to the side of the wall not exposed to fire, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The thickness of the finish shall first be corrected by multiplying the actual thickness of the finish by the applicable factor determined from Table 721.2.1.4(1) based on the type of aggregate in the concrete. The corrected thickness of finish shall then be added to the actual or equivalent thickness of concrete and fire-resistance rating of the concrete and finish determined from Table 721.2.1.1, Figure 721.2.1.2 or Table 721.2.1.2(1).

**721.2.1.4.2 Fire-exposed side.** Where gypsum wallboard or plaster is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The time assigned to the finish as established by Table 721.2.1.4(2) shall be added to the fire-resistance rating determined from Table 721.2.1.1 or Figure 721.2.1.2, or Table 721.2.1.2(1) for the concrete alone, or to the rating determined in Section 721.2.1.4.1 for the concrete and finish on the nonfire-exposed side.



For SI: 1 inch = 25.4 mm.

**FIGURE 721.2.1.3.1**  
**CERAMIC FIBER JOINT PROTECTION**

**TABLE 721.2.1.4(1)**  
**MULTIPLYING FACTOR FOR FINISHES ON NONFIRE-EXPOSED SIDE OF WALL**

TYPE OF FINISH APPLIED TO CONCRETE OR CONCRETE MASONRY WALL	TYPE OF AGGREGATE USED IN CONCRETE OR CONCRETE MASONRY			
	Concrete: siliceous or carbonate Concrete Masonry: siliceous or carbonate; solid clay brick	Concrete: sand-lightweight Concrete Masonry: clay tile; hollow clay brick; concrete masonry units of expanded shale and < 20% sand	Concrete: lightweight Concrete Masonry: concrete masonry units of expanded shale, expanded clay, expanded slag, or pumice < 20% sand	Concrete Masonry: concrete masonry units of expanded slag, expanded clay, or pumice
Portland cement-sand plaster	1.00	0.75 <sup>a</sup>	0.75 <sup>a</sup>	0.50 <sup>a</sup>
Gypsum-sand plaster	1.25	1.00	1.00	1.00
Gypsum-vermiculite or perlite plaster	1.75	1.50	1.25	1.25
Gypsum wallboard	3.00	2.25	2.25	2.25

For SI: 1 inch = 25.4 mm.

- a. For Portland cement-sandplaster  $\frac{5}{8}$  inch or less in thickness and applied directly to the masonry on the nonfire-exposed side of the wall, the multiplying factor shall be 1.00. NYC

**TABLE 721.2.1.4(2)**  
**TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL**

FINISH DESCRIPTION	TIME (minute)
Gypsum wallboard $\frac{3}{8}$ inch	10
$\frac{1}{2}$ inch	15
$\frac{5}{8}$ inch	20
2 layers of $\frac{3}{8}$ inch	25
1 layer $\frac{3}{8}$ inch, 1 layer $\frac{1}{2}$ inch	35
2 layers $\frac{1}{2}$ inch	40
Type X gypsum wallboard $\frac{1}{2}$ inch	25
$\frac{5}{8}$ inch	40
Portland cement-sand plaster applied directly to concrete masonry	See Note a
Portland cement-sand plaster on metal lath $\frac{3}{4}$ inch	20
$\frac{7}{8}$ inch	25
1 inch	30
Gypsum sand plaster on $\frac{3}{8}$ -inch gypsum lath $\frac{1}{2}$ inch	35
$\frac{5}{8}$ inch	40
$\frac{3}{4}$ inch	50
Gypsum sand plaster on metal lath $\frac{3}{4}$ inch	50
$\frac{7}{8}$ inch	60
1 inch	80

For SI: 1 inch = 25.4 mm.

- a. The actual thickness of portland cement-sand plaster, provided it is  $\frac{5}{8}$  inch or less in thickness, shall be permitted to be included in determining the equivalent thickness of the masonry for use in Table 721.3.2

**721.2.1.4.3 Nonsymmetrical assemblies.** For a wall having no finish on one side or different types or thicknesses of finish on each side, the calculation procedures of Sections 721.2.1.4.1 and 721.2.1.4.2 shall be performed twice, assuming either side of

the wall to be the fire-exposed side. The fire-resistance rating of the wall shall not exceed the lower of the two values.

**Exception:** For an exterior wall with a fire separation distance greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

**721.2.1.4.4 Minimum concrete fire-resistance rating.** Where finishes applied to one or both sides of a concrete wall contribute to the fire-resistance rating, the concrete alone shall provide not less than one-half of the total required fire-resistance rating. Additionally, the contribution to the fire resistance of the finish on the nonfire-exposed side of a load-bearing wall shall not exceed one-half the contribution of the concrete alone.

**721.2.1.4.5 Concrete finishes.** Finishes on concrete walls that are assumed to contribute to the total fire-resistance rating of the wall shall comply with the installation requirements of Section 721.3.2.5.

**721.2.2 Concrete floor and roof slabs.** Reinforced and prestressed floors and roofs shall comply with Section 721.2.2.1. Multicourse floors and roofs shall comply with Sections 721.2.2.2 and 721.2.2.3, respectively.

**721.2.2.1 Reinforced and prestressed floors and roofs.** The minimum thicknesses of reinforced and prestressed concrete floor or roof slabs for fire-resistance ratings of 1 hour to 4 hours are shown in Table 721.2.2.1.

**TABLE 721.2.2.1**  
**MINIMUM SLAB THICKNESS (inches)**

CONCRETE TYPE	FIRE-RESISTANCE RATING (hour)				
	1	1½	2	3	4
Siliceous	3.5	4.3	5.0	6.2	7.0
Carbonate	3.2	4.0	4.6	5.7	6.6
Sand-lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

For SI: 1 inch = 25.4 mm.



**721.2.2.1.1 Hollow-core prestressed slabs.** For hollow-core prestressed concrete slabs in which the cores are of constant cross section throughout the length, the equivalent thickness shall be permitted to be obtained by dividing the net cross-sectional area of the slab including grout in the joints, by its width.

**721.2.2.1.2 Slabs with sloping soffits.** The thickness of slabs with sloping soffits (see Figure 721.2.2.1.2) shall be determined at a distance  $2t$  or 6 inches (152 mm), whichever is less, from the point of minimum thickness, where  $t$  is the minimum thickness.

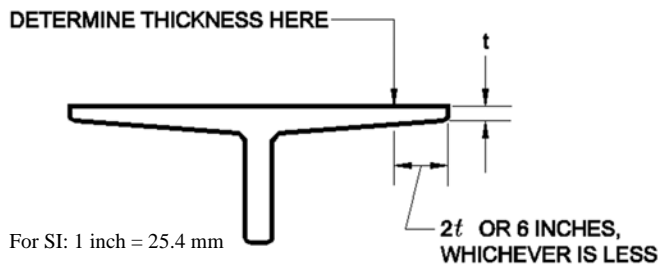


FIGURE 721.2.2.1.2  
DETERMINATION OF SLAB THICKNESS  
FOR SLOPING SOFFITS

**721.2.2.1.3 Slabs with ribbed soffits.** The thickness of slabs with ribbed or undulating soffits (see Figure 721.2.2.1.3) shall be determined by one of the following expressions, whichever is applicable:

For  $s \geq 4t$ , the thickness to be used shall be  $t$

For  $s \leq 2t$ , the thickness to be used shall be  $t_e$

For  $4t > s > 2t$ , the thickness to be used shall be  $t + [(4t/s) - 1]\{t_e - t\}$  (Equation 7-5)

where:

$s$  = Spacing of ribs or undulations.

$t$  = Minimum thickness.

$t_e$  = Equivalent thickness of the slab calculated as the net area of the slab divided by the width, in which the maximum thickness used in the calculation shall not exceed  $2t$ .

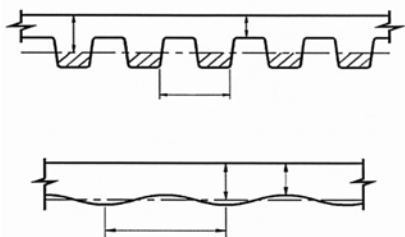
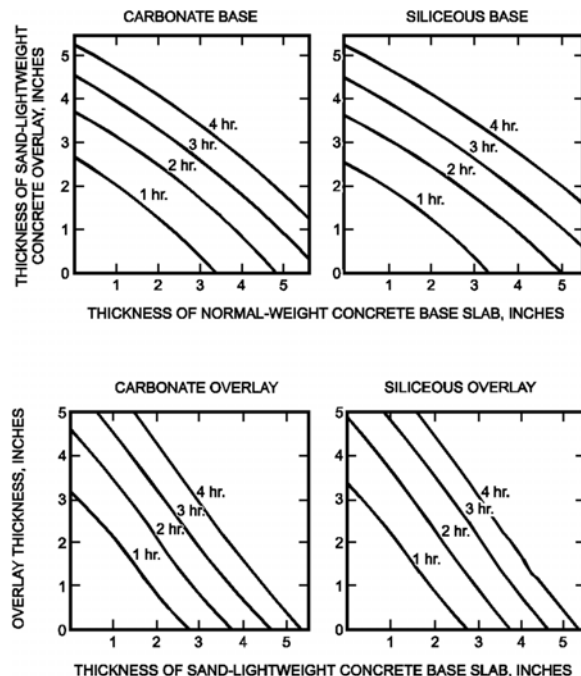


FIGURE 721.2.2.1.3  
SLABS WITH RIBBED OR UNDULATING SOFFITS

**721.2.2.2 Multicourse floors.** The fire-resistance ratings of floors that consist of a base slab of concrete with a topping (overlay) of a different type of concrete shall comply with Figure 721.2.2.2.



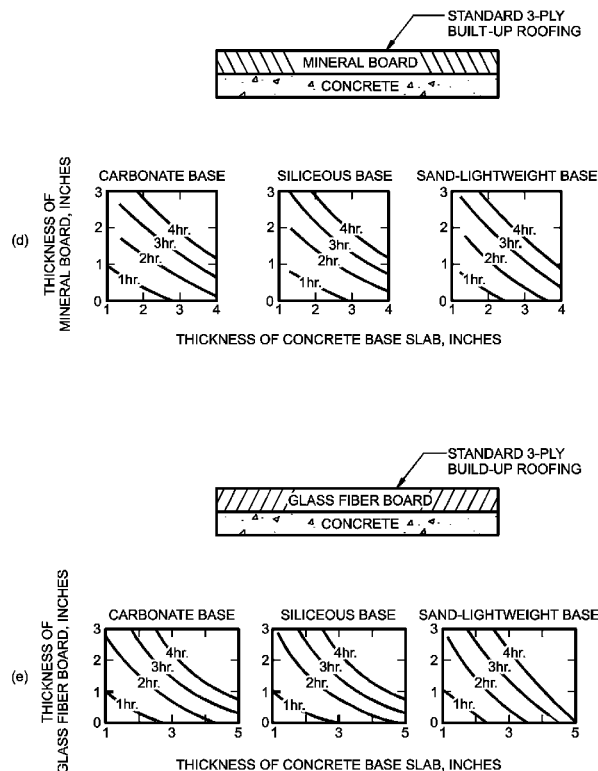
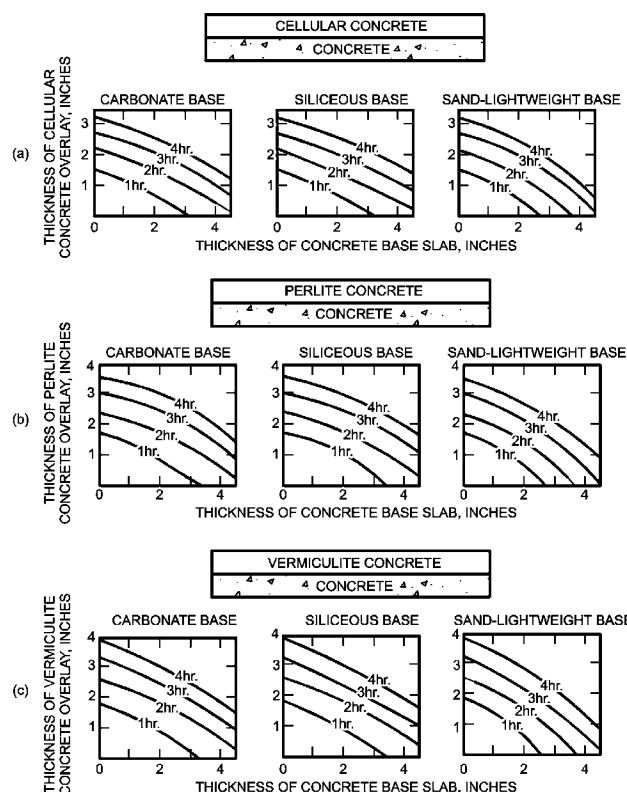
For SI: 1 inch = 25.4 mm.

FIGURE 721.2.2.2  
FIRE-RESISTANCE RATINGS FOR TWO-COURSE CONCRETE  
FLOORS

**721.2.2.3 Multicourse roofs.** The fire-resistance ratings of roofs which consist of a base slab of concrete with a topping (overlay) of an insulating concrete or with an insulating board and built-up roofing shall comply with Figures 721.2.2.3(1) and 721.2.2.3(2).

**721.2.2.3.1 Heat transfer.** For the transfer of heat, three-ply built-up roofing contributes 10 minutes to the fire-resistance rating. The fire-resistance rating for concrete assemblies such as those shown in Figure 721.2.2.3(1) shall be increased by 10 minutes. This increase is not applicable to those shown in Figure 721.2.2.3(2).

**721.2.2.4 Joints in precast slabs.** Joints between adjacent precast concrete slabs need not be considered in calculating the slab thickness provided that a concrete topping at least 1 inch (25 mm) thick is used. Where no concrete topping is used, joints must be grouted to a depth of at least one-third the slab thickness at the joint, but not less than 1 inch (25 mm), or the joints must be made fire resistant by other approved methods.



For SI: 1 inch = 25.4 mm.

**FIGURE 721.2.2.3(2)**  
**FIRE-RESISTANCE RATINGS FOR CONCRETE**  
**ROOF ASSEMBLIES**

For SI: 1 inch = 25.4 mm.

**FIGURE 721.2.2.3(1)**  
**FIRE-RESISTANCE RATINGS FOR CONCRETE**  
**ROOF ASSEMBLIES**

**TABLE 721.2.3(1)**  
**COVER THICKNESS FOR REINFORCED CONCRETE FLOOR OR ROOF SLABS (inches)**

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING (hours)									
	Restrained					Unrestrained				
	1	1½	2	3	4	1	1½	2	3	4
Siliceous	¾	¾	¾	¾	¾	¾	¾	1	1¼	1⅝
Carbonate	¾	¾	¾	¾	¾	¾	¾	¾	1¼	1¼
Sand-lightweight or lightweight	¾	¾	¾	¾	¾	¾	¾	¾	1¼	1¼

For SI: 1 inch = 25.4 mm.

**TABLE 721.2.3(2)**  
**COVER THICKNESS FOR PRESTRESSED CONCRETE FLOOR OR ROOF SLABS (inches)**

CONCRETE AGGREGATE TYPE	FIRE-RESISTANCE RATING (hours)									
	Restrained					Unrestrained				
	1	1½	2	3	4	1	1½	2	3	4
Siliceous	¾	¾	¾	¾	¾	1⅛	1½	1¾	2⅜	2¾
Carbonate	¾	¾	¾	¾	¾	1	1⅜	1⅝	2⅛	2¼
Sand-lightweight or lightweight	¾	¾	¾	¾	¾	1	1⅜	1½	2	2¼

For SI: 1 inch = 25.4 mm.

# FIRE AND SMOKE PROTECTION FEATURES

**TABLE 721.2.3(3)**  
**MINIMUM COVER FOR MAIN REINFORCING BARS OF REINFORCED CONCRETE BEAMS<sup>c</sup>**  
**(APPLICABLE TO ALL TYPES OF STRUCTURAL CONCRETE)**

RESTRAINED OR UNRESTRAINED <sup>a</sup>	BEAM WIDTH <sup>b</sup> (inches)	FIRE-RESISTANCE RATING (hours)				
		1	1½	2	3	4
Restrained	5	¾	¾	¾	1 <sup>a</sup>	1½ <sup>a</sup>
	7	¾	¾	¾	¾	¾
	≥ 10	¾	¾	¾	¾	¾
Unrestrained	5	¾	1	1¼	—	—
	7	¾	¾	¾	1¾	3
	≥ 10	¾	¾	¾	1	1¾

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for ratings of 4 hours or less.
- For beam widths between the tabulated values, the minimum cover thickness can be determined by direct interpolation.
- The cover for an individual reinforcing bar is the minimum thickness of concrete between the surface of the bar and the fire-exposed surface of the beam. For beams in which several bars are used, the cover for corner bars used in the calculation shall be reduced to one-half of the actual value. The cover for an individual bar must be not less than one-half of the value given in Table 721.2.3(3) nor less than ¾ inch.

**TABLE 721.2.3(4)**  
**MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS 8 INCHES OR GREATER IN WIDTH**

RESTRAINED OR UNRESTRAINED <sup>a</sup>	CONCRETE AGGREGATE TYPE	BEAM WIDTH <sup>b</sup> (inches)	FIRE-RESISTANCE RATING (hours)				
			1	1½	2	3	4
Restrained	Carbonate or siliceous	8	1½	1½	1½	1¾ <sup>a</sup>	2½ <sup>a</sup>
	Carbonate or siliceous	≥ 12	1½	1½	1½	1½	1⅞ <sup>a</sup>
	Sand lightweight	8	1½	1½	1½	1½	2a
	Sand lightweight	≥ 12	1½	1½	1½	1½	1⅝ <sup>a</sup>
Unrestrained	Carbonate or siliceous	8	1½	1¾	2½	5 <sup>c</sup>	—
	Carbonate or siliceous	≥ 12	1½	1½	1⅞ <sup>a</sup>	2½	3
	Sand lightweight	8	1½	1½	2	3¼	—
	Sand lightweight	≥ 12	1½	1½	1⅝	2	2½

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for 4-hour ratings or less.
- For beam widths between 8 inches and 12 inches, minimum cover thickness can be determined by direct interpolation.
- Not practical for 8-inch-wide beam but shown for purposes of interpolation.

**TABLE 721.2.3(5)**  
**MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS OF ALL WIDTHS**

RESTRAINED OR UNRESTRAINED <sup>a</sup>	CONCRETE AGGREGATE TYPE	BEAM AREA <sup>b</sup> A (square inches)	FIRE-RESISTANCE RATING (hours)				
			1	1½	2	3	4
Restrained	All	40 ≤ A ≤ 150	1½	1½	2	2½	—
	Carbonate or siliceous	150 < A ≤ 300	1½	1½	1½	1¾	2½
		300 < A	1½	1½	1½	1½	2
	Sand lightweight	150 < A	1½	1½	1½	1½	2
Unrestrained	All	40 ≤ A ≤ 150	2	2½	—	—	—
	Carbonate or siliceous	150 < A ≤ 300	1½	1¾	2½	—	—
		300 < A	1½	1½	2	3 <sup>c</sup>	4 <sup>c</sup>
	Sand lightweight	150 < A	1½	1½	2	3 <sup>c</sup>	4 <sup>c</sup>

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- Tabulated values for restrained assemblies apply to beams spaced more than 4 feet on center. For restrained beams spaced 4 feet or less on center, minimum cover of ¾ inch is adequate for 4-hour ratings or less.
- The cross-sectional area of a stem is permitted to include a portion of the area in the flange, provided the width of the flange used in the calculation does not exceed three times the average width of the stem.
- U-shaped or hooped stirrups spaced not to exceed the depth of the member and having a minimum cover of 1 inch shall be provided.

**721.2.3 Concrete cover over reinforcement.** The minimum thickness of concrete cover over reinforcement in concrete slabs, reinforced beams and prestressed beams shall comply with this section

**721.2.3.1 Slab cover.** The minimum thickness of concrete cover to the positive moment reinforcement shall comply with Table 721.2.3(1) for reinforced concrete and Table 721.2.3(1) for reinforced concrete and Table 721.2.3(2) for prestressed concrete. These tables are applicable for solid or hollow-core one-way or two-way slabs with flat undersurfaces. These tables are applicable to slabs that are either cast in place or precast. For precast prestressed concrete not covered elsewhere, the procedures contained PCI MNL 124 shall be acceptable.

**721.2.3.2 Reinforced beam cover.** The minimum thickness of concrete cover to the positive moment reinforcement (bottom steel) for reinforced concrete beams is shown in Table 721.2.3(3) for fire-resistance ratings of 1 hour to 4 hours.

**721.2.3.3 Prestressed beam cover.** The minimum thickness of concrete cover to the positive moment prestressing tendons (bottom steel) for restrained and unrestrained prestressed concrete beams and stemmed units shall comply with the values shown in Tables 721.2.3(4) and 721.2.3(5) for fire-resistance ratings of 1 hour to 4 hours. Values in Table 721.2.3(4) apply to beams 8 inches (203 mm) or greater in width. Values in Table 721.2.3(5) apply to beams or stems of any width, provided the cross-section area is not less than 40 square inches (25 806 mm<sup>2</sup>). In case of differences between the values determined from Table 721.2.3(4) or 721.2.3(5), it is permitted to use the smaller value. The concrete cover shall be calculated in accordance with Section 721.2.3.3.1. The minimum concrete cover for nonprestressed reinforcement in prestressed concrete beams shall comply with Section 721.2.3.2.

**721.2.3.3.1 Calculating concrete cover.** The concrete cover for an individual tendon is the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouped ducts, the assumed cover thickness is the minimum thickness of concrete between the surface of the duct and the fire-exposed surface of the beam. For beams in which two or more tendons are used, the cover is assumed to be the average of the minimum cover of the individual tendons. For corner tendons (tendons equal distance from the bottom and side), the minimum cover used in the calculation shall be one-half the actual value. For stemmed members with two or more prestressing tendons located along the vertical centerline of the stem, the average cover shall be the distance from the bottom of the member to the centroid of the tendons. The actual cover for any individual tendon shall not be less than one-half the smaller value shown in Tables 721.2.3(4) and 721.2.3(5), or 1 inch (25 mm), whichever is greater.

**721.2.4 Concrete columns.** Concrete columns shall comply with this section.

**TABLE 721.2.4**  
**MINIMUM DIMENSION OF CONCRETE COLUMNS (inches)**

TYPES OF CONCRETE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2 <sup>a</sup>	3 <sup>a</sup>	4 <sup>b</sup>
Siliceous	8	9	10	12	14
Carbonate	8	9	10	11	12
Sand-lightweight	8	8½	9	10½	12

For SI: 1 inch = 25 mm.

- The minimum dimension is permitted to be reduced to 8 inches for rectangular columns with two parallel sides at least 36 inches in length.
- The minimum dimension is permitted to be reduced to 10 inches for rectangular columns with two parallel sides at least 36 inches in length.

**721.2.4.1 Minimum size.** The minimum overall dimensions of reinforced concrete columns for fire-resistance ratings of 1 hour to 4 hours shall comply with this section.

**721.2.4.1.1 Concrete strength less than or equal to 12,000 psi.** For columns made with concrete having a specified compressive strength,  $f'_c$ , of less than or equal to 12,000 psi (82.7 MPa), the minimum dimension shall comply with Table 721.2.4.

**721.2.4.1.2 Concrete strength greater than 12,000 psi.** For columns made with concrete having a specified compressive strength,  $f'_c$ , greater than 12,000 psi (82.7 MPa), for fire-resistance ratings of 1 hour to 4 hours the minimum dimension shall be 24 inches (610 mm).

**721.2.4.2 Minimum cover for R/C columns.** The minimum thickness of concrete cover to the main longitudinal reinforcement in columns, regardless of the type of aggregate used in the concrete,  $f'_c$ , shall not be less than 1 inch (25 mm) times the number of hours of required fire resistance or 2 inches (51 mm), whichever is less.

**721.2.4.3 Tie and spiral reinforcement.** For concrete columns made with concrete having a specified compressive strength,  $f'_c$ , greater than 12,000 psi (82.7 MPa), tie and spiral reinforcement shall comply with the following:

- The free ends of rectangular ties shall terminate with a 135-degree (2.4 rad) standard tie hook.
- The free ends of circular ties shall terminate with a 90-degree (1.6 rad) standard tie hook.
- The free ends of spirals, including at lap splices, shall terminate with a 90-degree (1.6 rad) standard tie hook.

The hook extension at the free end of ties and spirals shall be the larger of six bar diameters and the extension required by Section 7.1.3 of ACI 318. Hooks shall project into the core of the column.

**721.2.4.4 Columns built into walls.** The minimum dimensions of Table 721.2.4 do not apply to a rein-



forced concrete column that is built into a concrete or masonry wall provided all of the following are met:

1. The fire-resistance rating for the wall is equal to or greater than the required rating of the column;
2. The main longitudinal reinforcing in the column has cover not less than that required by Section 721.2.4.2; and
3. Openings in the wall are protected in accordance with Table 715.4.

Where openings in the wall are not protected as required by Section 715.4, the minimum dimension of columns required to have a fire-resistance rating of 3 hours or less shall be 8 inches (203 mm), and 10 inches (254 mm) for columns required to have a fire-resistance rating of 4 hours, regardless of the type of aggregate used in the concrete.

**721.2.4.5 Precast cover units for steel columns.** See Section 721.5.1.4.

**721.3 Concrete masonry.** The provisions of this section contain procedures by which the fire-resistance ratings of concrete masonry are established by calculations.

**721.3.1 Equivalent thickness.** The equivalent thickness of concrete masonry construction shall be determined in accordance with the provisions of this section.

**721.3.1.1 Concrete masonry unit plus finishes.** The equivalent thickness of concrete masonry assemblies,  $T_{ea}$ , shall be computed as the sum of the equivalent thickness of the concrete masonry unit,  $T_e$ , as determined by Section 721.3.1.2, 721.3.1.3, or 721.3.1.4, plus the equivalent thickness of finishes,  $T_{ef}$ , determined in accordance with Section 721.3.2:

$$T_{ea} = T_e + T_{ef} \quad \text{(Equation 7-6)}$$

**721.3.1.2 UngROUTED or partially grouted construction.**  $T_e$  shall be the value obtained for the concrete masonry unit determined in accordance with ASTM C 140.

**721.3.1.3 Solid grouted construction.** The equivalent thickness,  $T_e$ , of solid grouted concrete masonry units is the actual thickness of the unit.

**721.3.1.4 Airspaces and cells filled with loose-fill material.** The equivalent thickness of completely filled hollow concrete masonry is the actual thickness of the unit when loose-fill materials are: sand, pea gravel, crushed stone, or slag that meet ASTM C 33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders that comply with ASTM C 331; or perlite or vermiculite meeting the requirements of ASTM C 549 and ASTM C 516, respectively.

**721.3.2 Concrete masonry walls.** The fire-resistance rating of walls and partitions constructed of concrete masonry units shall be determined from Table 721.3.2. The rating shall be based on the equivalent thickness of the masonry and type of aggregate used.

**721.3.2.1 Finish on nonfire-exposed side.** Where plaster or gypsum wallboard is applied to the side of the wall not exposed to fire, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The thickness of gypsum wallboard or plaster shall be corrected by multiplying the actual thickness of the finish by applicable factor determined from Table 721.2.1.4(1). This corrected thickness of finish shall be added to the equivalent thickness of masonry and the fire-resistance rating of the masonry and finish determined from Table 721.3.2.

**721.3.2.2 Finish on fire-exposed side.** Where plaster or gypsum wallboard is applied to the fire-exposed side of the wall, the contribution of the finish to the total fire-resistance rating shall be determined as follows: The time assigned to the finish as established by Table 721.2.1.4(2) shall be added to the fire-resistance rating determined in Section 721.3.2 for the masonry alone, or in Section 721.3.2.1 for the masonry and finish on the nonfire-exposed side.

**721.3.2.3 Nonsymmetrical assemblies.** For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, assuming either side of the wall to be the fire-exposed

**TABLE 721.3.2**  
**MINIMUM EQUIVALENT THICKNESS (inches) OF BEARING OR NONBEARING CONCRETE MASONRY WALLS<sup>a,b,c,d</sup>**

TYPE OF AGGREGATE	FIRE-RESISTANCE RATING (hours)														
	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Pumice or expanded slag	1.5	1.9	2.1	2.5	2.7	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.5	4.7
Expanded shale, clay or slate	1.8	2.2	2.6	2.9	3.3	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	4.9	5.1
Limestone, cinders or unexpanded slag	1.9	2.3	2.7	3.1	3.4	3.7	4.0	4.3	4.5	4.8	5.0	5.2	5.5	5.7	5.9
Calcareous or siliceous gravel	2.0	2.4	2.8	3.2	3.6	3.9	4.2	4.5	4.8	5.0	5.3	5.5	5.8	6.0	6.2

For SI: 1 inch = 25.4 mm.

a. Values between those shown in the table can be determined by direct interpolation.

b. Where combustible members are framed into the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall not be less than 93 percent of the thickness shown in the table.

c. Requirements of ASTM C 55, ASTM C 73, ASTM C 90 or ASTM C 744 shall apply.

d. Minimum required equivalent thickness corresponding to the hourly fire-resistance rating for units with a combination of aggregate shall be determined by linear interpolation based on the percent by volume of each aggregate used in manufacture.

side. The fire-resistance rating of the wall shall not exceed the lower of the two values calculated.

**Exception:** For exterior walls with a fire separation distance greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

**721.3.2.4 Minimum concrete masonry fire-resistance rating.** Where the finish applied to a concrete masonry wall contributes to its fire-resistance rating, the masonry alone shall provide not less than one-half the total required fire-resistance rating.

**721.3.2.5 Attachment of finishes.** Installation of finishes shall be as follows:

1. Gypsum wallboard and gypsum lath applied to concrete masonry or concrete walls shall be secured to wood or steel furring members spaced not more than 16 inches (406 mm) on center (o.c.).
2. Gypsum wallboard shall be installed with the long dimension parallel to the furring members and shall have all joints finished.
3. Other aspects of the installation of finishes shall comply with the applicable provisions of Chapters 7 and 25.

**721.3.3 Multiwythe masonry walls.** The fire-resistance rating of wall assemblies constructed of multiple wythes of masonry materials shall be permitted to be based on the fire-resistance rating period of each wythe and the continuous airspace between each wythe in accordance with the following formula:

$$R_A = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + A_1 + A_2 + \dots + A_n)^{1.7} \quad (\text{Equation 7-7})$$

where:

$R_A$  = Fire endurance rating of the assembly (hours).

$R_1, R_2, \dots, R_n$  = Fire endurance rating of wythes for 1, 2,  $n$  (hours), respectively.

$A_1, A_2, \dots, A_n$  = 0.30, factor for each continuous airspace for 1, 2,  $n$ , respectively, having a depth of  $\frac{1}{2}$  inch (12.7 mm) or more between wythes.

**TABLE 721.4.1(1)**  
**FIRE-RESISTANCE PERIODS OF CLAY MASONRY WALLS**

MATERIAL TYPE	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE RESISTANCE <sup>a,b,c</sup> (inches)			
	1 hour	2 hour	3 hour	4 hour
Solid brick of clay or shale <sup>d</sup>	2.7	3.8	4.9	6.0
Hollow brick or tile of clay or shale, unfilled	2.3	3.4	4.3	5.0
Hollow brick or tile of clay or shale, grouted or filled with materials specified in Section 721.4.1.1.3	3.0	4.4	5.5	6.6

For SI: 1 inch = 25.4 mm.

a. Equivalent thickness as determined from Section 721.4.1.1.

b. Calculated fire resistance between the hourly increments listed shall be determined by linear interpolation.

c. Where combustible members are framed in the wall, the thickness of solid material between the end of each member and the opposite face of the wall, or between members set in from opposite sides, shall not be less than 93 percent of the thickness shown.

d. For units in which the net cross-sectional area of cored brick in any plane parallel to the surface containing the cores is at least 75 percent of the gross cross-sectional area measured in the same plane.

**721.3.4 Concrete masonry lintels.** Fire-resistance ratings for concrete masonry lintels shall be determined based upon the nominal thickness of the lintel and the minimum thickness of concrete masonry or concrete, or any combination thereof, covering the main reinforcing bars, as determined according to Table 721.3.4, or by approved alternate methods.

**TABLE 721.3.4**  
**MINIMUM COVER OF LONGITUDINAL REINFORCEMENT IN FIRE-RESISTANCE-RATED REINFORCED CONCRETE MASONRY LINTELS (inches)**

NOMINAL WIDTH OF LINTEL (inches)	FIRE-RESISTANCE RATING (hours)			
	1	2	3	4
6	1½	2	—	—
8	1½	1½	1¾	3
10 or greater	1½	1½	1½	1¾

For SI: 1 inch = 25.4 mm.

**721.3.5 Concrete masonry columns.** The fire-resistance rating of concrete masonry columns shall be determined based upon the least plan dimension of the column in accordance with Table 721.3.5 or by approved alternate methods.

**TABLE 721.3.5**  
**MINIMUM DIMENSION OF CONCRETE MASONRY COLUMNS (inches)**

FIRE-RESISTANCE RATING (hours)			
1	2	3	4
8	10	12	14

For SI: 1 inch = 25.4 mm.

**721.4 Clay brick and tile masonry.** The provisions of this section contain procedures by which the fire-resistance ratings of clay brick and tile masonry are established by calculations.

**721.4.1 Masonry walls.** The fire-resistance rating of masonry walls shall be based upon the equivalent thickness as calculated in accordance with this section. The calculation shall take into account finishes applied to the wall and airspaces between wythes in multiwythe construction.

**TABLE 721.4.1(2)**  
**FIRE-RESISTANCE RATINGS FOR BEARING STEEL FRAME**  
**BRICK VENEER WALLS OR PARTITIONS**

WALL OR PARTITION ASSEMBLY	PLASTER SIDE EXPOSED (hours)	BRICK FACED SIDE EXPOSED (hours)
Outside facing of steel studs: $\frac{1}{2}$ " wood fiberboard sheathing next to studs, $\frac{3}{4}$ " airspace formed with $\frac{3}{4}$ " $\times$ $1\frac{5}{8}$ " wood strips placed over the fiberboard and secured to the studs; metal or wire lath nailed to such strips, $\frac{3}{4}$ " brick veneer held in place by filling $\frac{3}{4}$ " airspace between the brick and lath with mortar. Inside facing of studs: $\frac{3}{4}$ " unsanded gypsum plaster on metal or wire lath attached to $\frac{5}{16}$ " wood strips secured to edges of the studs.	1.5	4
Outside facing of steel studs: 1" insulation board sheathing attached to studs, 1" airspace, and $\frac{3}{4}$ " brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: $\frac{7}{8}$ " sanded gypsum plaster (1:2 mix) applied on metal or wire lath attached directly to the studs.	1.5	4
Same as above except use $\frac{7}{8}$ " vermiculite—gypsum plaster or 1" sanded gypsum plaster (1:2 mix) applied to metal or wire.	2	4
Outside facing of steel studs: $\frac{1}{2}$ " gypsum sheathing board, attached to studs, and $\frac{3}{4}$ " brick veneer attached to steel frame with metal ties every 5th course. Inside facing of studs: $\frac{1}{2}$ " sanded gypsum plaster (1:2 mix) applied to $\frac{1}{2}$ " perforated gypsum lath securely attached to studs and having strips of metal lath 3 inches wide applied to all horizontal joints of gypsum lath.	2	4

For SI: 1 inch = 25.4 mm

**TABLE 721.4.1(3)**  
**VALUES OF  $R_n^{0.59}$**

$R_n^{0.59}$	R (hours)
1	1.0
2	1.50
3	1.91
4	2.27

**TABLE 721.4.1(4)**  
**COEFFICIENTS FOR PLASTER,  $p^P$**

THICKNESS OF PLASTER (inch)	ONE SIDE	TWO SIDE
$\frac{1}{2}$	0.3	0.6
$\frac{5}{8}$	0.37	0.75
$\frac{3}{4}$	0.45	0.90

For SI: 1 inch = 25.4 mm.

a. Values listed in table are for 1:3 sanded gypsum plaster.

**TABLE 721.4.1(5)**  
**REINFORCED MASONRY LINTELS**

NOMINAL LINTEL WIDTH (inches)	MINIMUM LONGITUDINAL REINFORCEMENT COVER FOR FIRE RESISTANCE (inch)			
	1 hour	2 hour	3 hour	4 hour
6	$1\frac{1}{2}$	2	NP	NP
8	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$	3
10 or more	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{3}{4}$

For SI: 1 inch = 25.4 mm.

NP = Not permitted.

**TABLE 721.4.1(6)**  
**REINFORCED CLAY MASONRY COLUMNS**

COLUMN SIZE	FIRE-RESISTANCE RATING (hour)			
	1	2	3	4
Minimum column dimension (inches)	8	10	12	14

For SI: 1 inch = 25.4 mm.

**721.4.1.1 Equivalent thickness.** The fire-resistance ratings of walls or partitions constructed of solid or hollow clay masonry units shall be determined from Table 721.4.1(1) or 721.4.1(2). The equivalent thickness of the clay masonry unit shall be determined by Equation 7-8 when using Table 721.4.1(1). The fire-resistance rating determined from Table 721.4.1(1) shall be permitted to be used in the calculated fire-resistance rating procedure in Section 721.4.2.

$$T_e = V_n / LH \quad \text{(Equation 7-8)}$$

where:

$T_e$  = The equivalent thickness of the clay masonry unit (inches).

$V_n$  = The net volume of the clay masonry unit ( $\text{inch}^3$ ).

$L$  = The specified length of the clay masonry unit (inches).

$H$  = The specified height of the clay masonry unit (inches).

**721.4.1.1.1 Hollow clay units.** The equivalent thickness,  $T_e$ , shall be the value obtained for hollow clay units as determined in accordance with Equation 7-8. The net volume,  $V_n$ , of the units shall be determined using the gross volume and percentage

of void area determined in accordance with ASTM C 67.

**721.4.1.1.2 Solid grouted clay units.** The equivalent thickness of solid grouted clay masonry units shall be taken as the actual thickness of the units.

**721.4.1.1.3 Units with filled cores.** The equivalent thickness of the hollow clay masonry units is the actual thickness of the unit when completely filled with loose-fill materials of: sand, pea gravel, crushed stone, or slag that meet ASTM C 33 requirements; pumice, scoria, expanded shale, expanded clay, expanded slate, expanded slag, expanded fly ash, or cinders in compliance with ASTM C 331; or perlite or vermiculite meeting the requirements of ASTM C 549 and ASTM C 516, respectively.

**721.4.1.2 Plaster finishes.** Where plaster is applied to the wall, the total fire-resistance rating shall be determined by the formula:

$$R = (R_n^{0.59} + pl)^{1.7} \quad \text{(Equation 7-9)}$$

where:

$R$  = The fire endurance of the assembly (hours).

$R_n$  = The fire endurance of the individual wall (hours).

$pl$  = Coefficient for thickness of plaster.

Values for  $R_n^{0.59}$  for use in Equation 7-9 are given in Table 721.4.1(3). Coefficients for thickness of plaster shall be selected from Table 721.4.1(4) based on the actual thickness of plaster applied to the wall or partition and whether one or two sides of the wall are plastered.

**721.4.1.3 Multiwythe walls with airspace.** Where a continuous airspace separates multiple wythes of the wall or partition, the total fire-resistance rating shall be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59} + as)^{1.7} \quad \text{(Equation 7-10)}$$

where:

$R$  = The fire endurance of the assembly (hours).

$R_1$ ,  $R_2$  and  $R_n$  = The fire endurance of the individual wythes (hours).

$as$  = Coefficient for continuous airspace.

Values for  $R_n^{0.59}$  for use in Equation 7-10 are given in Table 721.4.1(3). The coefficient for each continuous airspace of  $1/2$  inch to  $3 1/2$  inches (12.7 to 89 mm) separating two individual wythes shall be 0.3.

**721.4.1.4 Nonsymmetrical assemblies.** For a wall having no finish on one side or having different types or thicknesses of finish on each side, the calculation procedures of this section shall be performed twice, assuming either side to be the fire-exposed side of the wall. The fire resistance of the wall shall not exceed the lower of the two values determined.

**Exception:** For exterior walls with a fire separation distance greater than 5 feet (1524 mm), the fire shall be assumed to occur on the interior side only.

**721.4.2 Multiwythe walls.** The fire-resistance rating for walls or partitions consisting of two or more dissimilar wythes shall be permitted to be determined by the formula:

$$R = (R_1^{0.59} + R_2^{0.59} + \dots + R_n^{0.59})^{1.7} \quad \text{(Equation 7-11)}$$

where:

$R$  = The fire endurance of the assembly (hours).

$R_1$ ,  $R_2$  and  $R_n$  = The fire endurance of the individual wythes (hours).

Values for  $R_n^{0.59}$  for use in Equation 7-11 are given in Table 721.4.1(3).

**721.4.2.1 Multiwythe walls of different material.** For walls that consist of two or more wythes of different materials (concrete or concrete masonry units) in combination with clay masonry units, the fire-resistance rating of the different materials shall be permitted to be determined from Table 721.2.1.1 for concrete; Table 721.3.2 for concrete masonry units or Table 721.4.1(1) or 721.4.1(2) for clay and tile masonry units.

**721.4.3 Reinforced clay masonry lintels.** Fire-resistance ratings for clay masonry lintels shall be determined based on the nominal width of the lintel and the minimum covering for the longitudinal reinforcement in accordance with Table 721.4.1(5).

**721.4.4 Reinforced clay masonry columns.** The fire-resistance ratings shall be determined based on the last plan dimension of the column in accordance with Table 721.4.1(6). The minimum cover for longitudinal reinforcement shall be 2 inches (51 mm).

**721.5 Steel assemblies.** The provisions of this section contain procedures by which the fire-resistance ratings of steel assemblies are established by calculations.

**721.5.1 Structural steel columns.** The fire-resistance ratings of steel columns shall be based on the size of the element and the type of protection provided in accordance with this section.

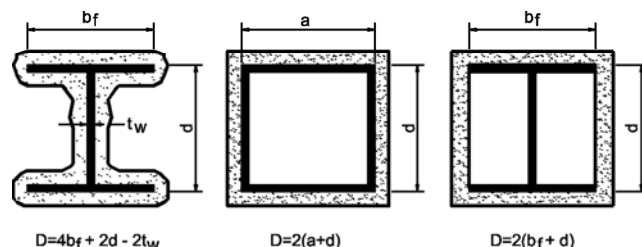
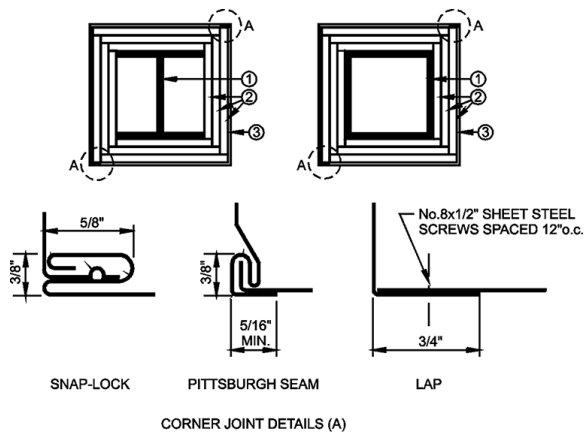


FIGURE 721.5.1(1)  
DETERMINATION OF THE HEATED PERIMETER  
OF STRUCTURAL STEEL COLUMNS

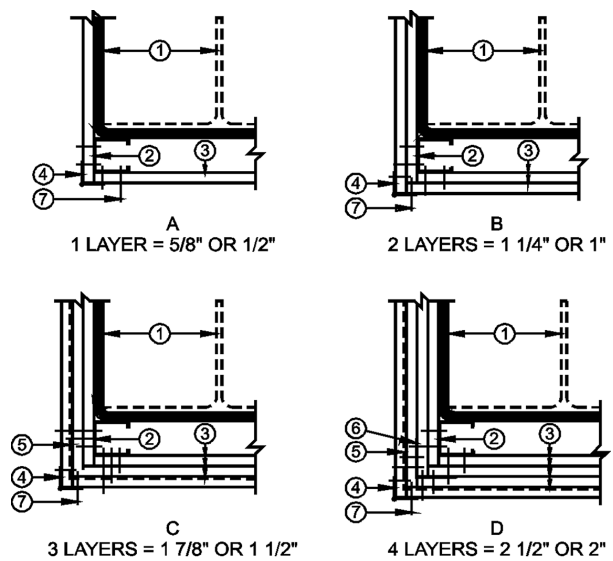




**FIGURE 721.5.1(2)**  
**GYPSUM WALLBOARD PROTECTED STRUCTURAL STEEL**  
**COLUMNS WITH SHEET STEEL COLUMN COVERS**

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

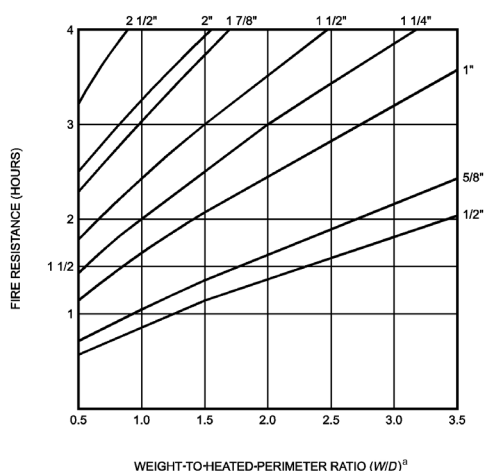
1. Structural steel column, either wide flange or tubular shapes.
2. Type X gypsum wallboard in accordance with ASTM C 36. For single-layer applications, the wallboard shall be applied vertically with no horizontal joints. For multiple-layer applications, horizontal joints are permitted at a minimum spacing of 8 feet, provided that the joints in successive layers are staggered at least 12 inches. The total required thickness of wallboard shall be determined on the basis of the specified fire-resistance rating and the weight-to-heated-perimeter ratio ( $W/D$ ) of the column. For fire-resistance ratings of 2 hours or less, one of the required layers of gypsum wallboard may be applied to the exterior of the sheet steel column covers with 1-inch long Type S screws spaced 1 inch from the wallboard edge and 8 inches on center. For such installations, 0.0149-inch minimum thickness galvanized steel corner beads with  $1\frac{1}{2}$ -inch legs shall be attached to the wallboard with Type S screws spaced 12 inches on center.
3. For fire-resistance ratings of 3 hours or less, the column covers shall be fabricated from 0.0239-inch minimum thickness galvanized or stainless steel. For 4-hour fire-resistance ratings, the column covers shall be fabricated from 0.0239-inch minimum thickness stainless steel. The column covers shall be erected with the Snap Lock or Pittsburgh joint details. For fire-resistance ratings of 2 hours or less, column covers fabricated from 0.0269-inch minimum thickness galvanized or stainless steel shall be permitted to be erected with lap joints. The lap joints shall be permitted to be located anywhere around the perimeter of the column cover. The lap joints shall be secured with  $\frac{1}{2}$ -inch-long No.8 sheet metal screws spaced 12 inches on center. The column covers shall be provided with a minimum expansion clearance of  $\frac{1}{8}$  inch per linear foot between the ends of the cover and any restraining construction.



**FIGURE 721.5.1(3)**  
**GYPSUM WALLBOARD PROTECTED STRUCTURAL STEEL**  
**COLUMNS WITH STEEL STUD/SCREW ATTACHMENT SYSTEM**

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm.

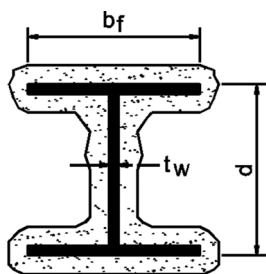
1. Structural steel column, either wide flange or tubular shapes.
2.  $1\frac{5}{8}$ -inch deep studs fabricated from 0.0179-inch minimum thickness galvanized steel with  $1\frac{5}{16}$  or  $1\frac{7}{16}$ -inch legs. The length of the steel studs shall be  $\frac{1}{2}$  inch less than the height of the assembly.
3. Type X gypsum wallboard in accordance with ASTM C 36. For single-layer applications, the wallboard shall be applied vertically with no horizontal joints. For multiple-layer applications, horizontal joints are permitted at a minimum spacing of 8 feet, provided that the joints in successive layers are staggered at least 12 inches. The total required thickness of wallboard shall be determined on the basis of the specified fire-resistance rating and the weight-to-heated-perimeter ratio ( $W/D$ ) of the column.
4. Galvanized 0.0149-inch minimum thickness steel corner beads with  $1\frac{1}{2}$ -inch legs attached to the wallboard with 1-inch-long Type S screws spaced 12 inches on center.
5. No. 18 SWG steel tie wires spaced 24 inches on center.
6. Sheet metal angles with 2-inch legs fabricated from 0.0221-inch minimum thickness galvanized steel.
7. Type S screws, 1 inch long, shall be used for attaching the first layer of wallboard to the steel studs and the third layer to the sheet metal angles at 24 inches on center. Type S screws  $1\frac{3}{4}$ -inch long shall be used for attaching the second layer of wallboard to the steel studs and the fourth layer to the sheet metal angles at 12 inches on center. Type S screws  $2\frac{1}{4}$  inches long shall be used for attaching the third layer of wallboard to the steel studs at 12 inches on center.



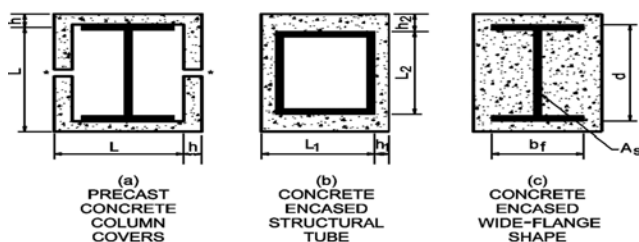
**FIGURE 721.5.1(4)**  
**FIRE RESISTANCE OF STRUCTURAL STEEL COLUMNS**  
**PROTECTED WITH VARIOUS THICKNESSES OF**  
**TYPE X GYPSUM WALLBOARD**

For SI: 1 inch = 25.4 mm, 1 pound per linear foot/inch = 0.059 kg/m/mm.

- a. The  $W/D$  ratios for typical wide flange columns are listed in Table 721.5.1(1). For other column shapes, the  $W/D$  ratios shall be determined in accordance with Section 720.5.1.1.

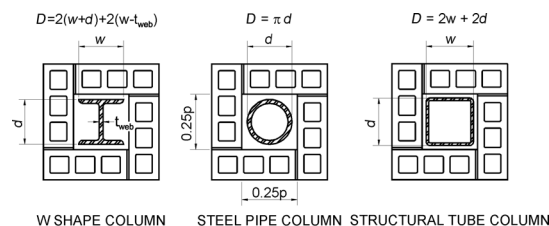


**FIGURE 721.5.1(5)**  
**WIDE FLANGE STRUCTURAL STEEL COLUMNS WITH**  
**SPRAY-APPLIED FIRE-RESISTANT MATERIALS**



**FIGURE 721.5.1(6)**  
**CONCRETE PROTECTED STRUCTURAL STEEL COLUMNS<sup>a,b</sup>**

- a. When the inside perimeter of the concrete protection is not square,  $L$  shall be taken as the average of  $L_1$  and  $L_2$ . When the thickness of concrete cover is not constant,  $h$  shall be taken as the average of  $h_1$  and  $h_2$ .
- b. Joints shall be protected with a minimum 1 inch thickness of ceramic fiber blanket but in no case less than one-half the thickness of the column cover (see Section 721.2.1.3).



For SI: 1 inch = 25.4 mm.

$d$  = Depth of a wide flange column, outside diameter of pipe column, or outside dimension of structural tubing column (inches).

$t_{web}$  = Thickness of web of wide flange column (inches).

$w$  = Width of flange of wide flange column (inches).

**FIGURE 721.5.1(7)**  
**CONCRETE OR CLAY MASONRY PROTECTED**  
**STRUCTURAL STEEL COLUMNS**

**721.5.1.1 General.** These procedures establish a basis for determining the fire resistance of column assemblies as a function of the thickness of fire-resistant material and, the weight,  $W$ , and heated perimeter,  $D$ , of steel columns. As used in these sections,  $W$  is the average weight of a structural steel column in pounds per linear foot. The heated perimeter,  $D$ , is the inside perimeter of the fire-resistant material in inches as illustrated in Figure 721.5.1(1).

**721.5.1.1.1 Nonload-bearing protection.** The application of these procedures shall be limited to column assemblies in which the fire-resistant material is not designed to carry any of the load acting on the column.

**721.5.1.1.2 Embedments.** In the absence of substantiating fire-endurance test results, ducts, conduit, piping, and similar mechanical, electrical, and plumbing installations shall not be embedded in any required fire-resistant materials.

**721.5.1.1.3 Weight-to-perimeter ratio.** Table 721.5.1(1) contains weight-to-heated-perimeter ratios ( $W/D$ ) for both contour and box fire-resistant profiles, for the wide flange shapes most often used as columns. For different fire-resistant protection profiles or column cross sections, the weight-to-heated-perimeter ratios ( $W/D$ ) shall be determined in accordance with the definitions given in this section.

**721.5.1.2 Gypsum wallboard protection.** The fire resistance of structural steel columns with weight to-heated-perimeter ratios ( $W/D$ ) less than or equal to 3.65 and which are protected with Type X gypsum wallboard shall be permitted to be determined from the following expression:

$$R = 130 \left[ \frac{h(W'/D)^{0.75}}{2} \right] \quad (\text{Equation 7-12})$$

where:

$R$  = Fire resistance (minutes).

$h$  = Total thickness of gypsum wallboard (inches).

$D$  = Heated perimeter of the structural steel column (inches).

$W'$  = Total weight of the structural steel column and gypsum wallboard protection (pounds per linear foot).

$W' = W + 50hD/144$ .

**721.5.1.2.1 Attachment.** The gypsum wallboard shall be supported as illustrated in either Figure 721.5.1(2) for fire-resistance ratings of 4 hours or less, or Figure 721.5.1(3) for fire-resistance ratings of 3 hours or less.

**721.5.1.2.2 Gypsum wallboard equivalent to concrete.** The determination of the fire resistance of structural steel columns from Figure 721.5.1(4) is permitted for various thicknesses of gypsum wallboard as a function of the weight-to-heated-perimeter ratio ( $W/D$ ) of the column. For structural steel columns with weight-to-heated-perimeter ratios ( $W/D$ ) greater than 3.65, the thickness of gypsum wallboard required for specified fire-resistance ratings shall be the same as the thickness determined for a W14 x 233 wide flange shape.

**721.5.1.3 Spray-applied fire-resistant materials.** The fire resistance of wide-flange structural steel columns protected with spray-applied fire-resistant materials, as illustrated in Figure 721.5.1(5), shall be permitted to be determined from the following expression:

$$R = [C_1 (W/D) + C_2] h \quad \text{(Equation 7-13)}$$

where:

$R$  = Fire resistance (minutes).

$h$  = Thickness of spray-applied fire-resistant material (inches).

$D$  = Heated perimeter of the structural steel column (inches).

$C_1$  and  $C_2$  = Material-dependent constants.

$W$  = Weight of structural steel column (pounds per linear foot).

**Exception:** The fire resistance of structural steel columns protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

**721.5.1.3.1 Material-dependent constants.** The material-dependent constants,  $C_1$  and  $C_2$ , shall be determined for specific fire-resistant materials on the basis of standard fire endurance tests in accordance with Section 703.2. Unless evidence is submitted to the commissioner substantiating a broader application, this expression shall be limited to determining the fire resistance of structural steel

columns with weight-to-heated-perimeter ratios ( $W/D$ ) between the largest and smallest columns for which standard fire-endurance test results are available.

**721.5.1.3.2 Identification.** Spray-applied fire-resistant materials shall be identified by density and thickness required for a given fire-resistance rating. NYC

**721.5.1.4 Concrete-protected columns.** The fire resistance of structural steel columns protected with concrete, as illustrated in Figure 721.5.1(6)(a) and (b), shall be permitted to be determined from the following expression:

$$R = R_o (1 + 0.03m) \quad \text{(Equation 7-14)}$$

where:

$$R_o = 10 (W/D)^{0.7} + 17 (h^{1.6}/k_c^{0.2}) \times [(1 + 26 \{H/p_c c h (L + h)\}^{0.8})]$$

As used in these expressions:†

$R$  = Fire endurance at equilibrium moisture conditions (minutes).

$R_o$  = Fire endurance at zero moisture content (minutes).

$m$  = Equilibrium moisture content of the concrete by volume (percent).

$W$  = Average weight of steel column (pounds per linear foot).

$D$  = Heated perimeter of steel column (inches).

$h$  = Thickness of the concrete cover (inches).

$k_c$  = Ambient temperature thermal conductivity of the concrete (Btu/hr ft °F).

$H$  = Ambient temperature thermal capacity of the steel column = 0.11  $W$  (Btu/ft°F).

$p_c$  = Concrete density (pounds per cubic foot).

$c_c$  = Ambient temperature specific heat of concrete (Btu/lb°F).

$L$  = Interior dimension of one side of a square concrete box protection (inches).

**721.5.1.4.1 Reentrant space filled.** For wide-flange steel columns completely encased in concrete with all reentrant spaces filled [Figure 721.5.1(6)(c)], the thermal capacity of the concrete within the reentrant spaces shall be permitted to be added to the thermal capacity of the steel column, as follows:

$$H = 0.11 W + (p_c c_c / 144) (b_f d - A_s) \quad \text{(Equation 7-15)}$$

where:

$b_f$  = Flange width of the steel column (inches).

$d$  = Depth of the steel column (inches).

$A_s$  = Cross-sectional area of the steel column (square inches).

**721.5.1.4.2 Concrete properties unknown.** If specific data on the properties of concrete are not available, the values given in Table 721.5.1(2) are permitted.

**721.5.1.4.3 Minimum concrete cover.** For structural steel column encased in concrete with all reentrant spaces filled, Figure 721.5.1(6)(c) and Tables 721.5.1(7) and 721.5.1(8) indicate the thickness of concrete cover required for various fire-resistance ratings for typical wide-flange sections. The thicknesses of concrete indicated in these tables also apply to structural steel columns larger than those listed.

**721.5.1.4.4 Minimum precast concrete cover.** For structural steel columns protected with precast concrete column covers as shown in Figure 721.5.1(6)(a), Tables 721.5.1(9) and 721.5.1(10) indicate the thickness of the column covers required for various fire-resistance ratings for typical wide-flange shapes. The thicknesses of concrete given in these tables also apply to structural steel columns larger than those listed.

**721.5.1.4.5 Masonry protection.** The fire resistance of structural steel columns protected with concrete masonry units or clay masonry units as illustrated in Figure 721.5.1(7), shall be permitted to be determined from the following expression:

$$R = 0.17 (W/D)^{0.7} + [0.285 (T_e^{1.6}/K^{0.2})] [1.0 + 42.7 \{ (A_s/d_m T_e) / (0.25p + T_e) \}^{0.8}] \quad \text{(Equation 7-16)}$$

where:

$R$  = Fire-resistance rating of column assembly (hours).

$W$  = Average weight of steel column (pounds per foot).

$D$  = Heated perimeter of steel column (inches) [see Figure 721.5.1(7)].

$T_e$  = Equivalent thickness of concrete or clay masonry unit (inches) (see Table 721.3.2 Note a or Section 721.4.1).

$K$  = Thermal conductivity of concrete or clay masonry unit (Btu/hr ft °F) [see Table 721.5.1(3)].

$A_s$  = Cross-sectional area of steel column (square inches).

$d_m$  = Density of the concrete or clay masonry unit (pounds per cubic foot).

$p$  = Inner perimeter of concrete or clay masonry protection (inches) [see Figure 721.5.1(7)].

**721.5.1.4.6 Equivalent concrete masonry thickness.** For structural steel columns protected with concrete masonry, Table 721.5.1(5) gives the equivalent thickness of concrete masonry required for various fire-resistance ratings for typical column shapes. For structural steel columns protected with clay masonry, Table 721.5.1(6) gives the equivalent thickness of concrete masonry required for various fire-resistance ratings for typical column shapes.

**721.5.2 Structural steel beams and girders.** The fire-resistance ratings of steel beams and girders shall be

based upon the size of the element and the type of protection provided in accordance with this section.

**721.5.2.1 Determination of fire resistance.** These procedures establish a basis for determining resistance of structural steel beams and girders which differ in size from that specified in approved fire-resistant assemblies as a function of the thickness of fire-resistant material and the weight ( $W$ ) and heated perimeter ( $D$ ) of the beam or girder. As used in these sections,  $W$  is the average weight of a structural steel member in pounds per linear foot (plf). The heated perimeter,  $D$ , is the inside perimeter of the fire-resistant material in inches as illustrated in Figure 721.5.2.

**721.5.2.1.1 Weight-to-heated perimeter.** The weight-to-heated-perimeter ratios ( $W/D$ ), for both contour and box fire-resistant protection profiles, for the wide flange shapes most often used as beams or girders are given in Table 721.5.1(4). For different shapes, the weight-to-heated-perimeter ratios ( $W/D$ ) shall be determined in accordance with the definitions given in this section.

**721.5.2.1.2 Beam and girder substitutions.** Except as provided for in Section 721.5.2.2, structural steel beams in approved fire-resistant assemblies shall be considered the minimum permissible size. Other beam or girder shapes shall be permitted to be substituted provided that the weight-to-heated-perimeter ratio ( $W/D$ ) of the substitute beam is equal to or greater than that of the beam specified in the approved assembly.

**721.5.2.2 Spray-applied fire-resistant materials.** The provisions in this section apply to structural steel beams and girders protected with spray-applied fire-resistant materials. Larger or smaller beam and girder shapes shall be permitted to be substituted for beams specified in approved unrestrained or restrained fire-resistance-rated assemblies provided that the thickness of the fire-resistant material is adjusted in accordance with the following expression:

$$h_2 = h_1 [(W_1/D_1) + 0.60] / [(W_2/D_2) + 0.60] \quad \text{(Equation 7-17)}$$

where:

$h$  = Thickness of spray-applied fire-resistant material in inches.

$W$  = Weight of the structural steel beam or girder in pounds per linear foot.

$D$  = Heated perimeter of the structural steel beam or girder in inches.

Subscript 1 refers to the beam and fire-resistant material thickness in the approved assembly.

Subscript 2 refers to the substitute beam or girder and the required thickness of fire-resistant material.

**Exception:** The fire resistance of structural steel beams and girders protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.



# FIRE AND SMOKE PROTECTION FEATURES

**TABLE 721.5.1(1)**  
**W/D RATIOS FOR STEEL COLUMNS**

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W14 × 233	2.49	3.65	W10 × 112	1.78	2.57
× 211	2.28	3.35	× 100	1.61	2.33
× 193	2.10	3.09	× 88	1.43	2.08
× 176	1.93	2.85	× 77	1.26	1.85
× 159	1.75	2.60	× 68	1.13	1.66
× 145	1.61	2.39	× 60	1.00	1.48
× 132	1.52	2.25	× 54	0.91	1.34
× 120	1.39	2.06	× 49	0.83	1.23
× 109	1.27	1.88	× 45	0.87	1.24
× 99	1.16	1.72	× 39	0.76	1.09
× 90	1.06	1.58	× 33	0.65	0.93
× 82	1.20	1.68			
× 74	1.09	1.53	W8 × 67	1.34	1.94
× 68	1.01	1.41	× 58	1.18	1.71
× 61	0.91	1.28	× 48	0.99S	1.44
× 53	0.89	1.21	× 40	0.83	1.23
× 48	0.81	1.10	× 35	0.73	1.08
× 43	0.73	0.99	× 31	0.65	0.97
			× 28	0.67	0.96
W12 × 190	2.46	3.51	× 24	0.58	0.83
× 170	2.22	3.20	× 21	0.57	0.77
× 152	2.01	2.90	× 18	0.49	0.67
× 136	1.82	2.63			
× 120	1.62	2.36	W6 × 25	0.69	1.00
× 106	1.44	2.11	× 20	0.56	0.82
× 96	1.32	1.93	× 16	0.57	0.78
× 87	1.20	1.76	× 15	0.42	0.63
× 79	1.10	1.61	× 12	0.43	0.60
× 72	1.00	1.48	× 9	0.33	0.46
× 65	0.91	1.35			
× 58	0.91	1.31	W5 × 19	0.64	0.93
× 53	0.84	1.20	× 16	0.54	0.80
× 50	0.89	1.23			
× 45	0.81	1.12	W4 × 13	0.54	0.79
× 40	0.72	1.00			

For SI: 1 pound per linear foot per inch = 0.059 kg/m/mm.

**TABLE 721.5.1(2)**  
**PROPERTIES OF CONCRETE**

PROPERTY	NORMAL WEIGHT CONCRETE	STRUCTURAL LIGHTWEIGHT CONCRETE
Thermal conductivity ( $k_c$ )	0.95 Btu/hr ft °F	0.35 Btu/hr ft °F
Specific heat ( $c_c$ )	0.20 Btu/lb °F	0.20 Btu/lb °F
Density ( $P_c$ )	145 lb/ft <sup>3</sup>	110 lb/ft <sup>3</sup>
Equilibrium (free) moisture content (m) by volume	4%	5%

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lb/ft<sup>3</sup> = 16.0185 kg/m<sup>3</sup>, Btu/hr ft °F = 1.731 W/(m·K).

**TABLE 721.5.1(3)**  
**THERMAL CONDUCTIVITY OF CONCRETE OR CLAY**  
**MASONRY UNITS**

DENSITY ( $d_m$ ) OF UNITS (lb/ft <sup>3</sup> )	THERMAL CONDUCTIVITY ( $k$ ) OF UNITS (Btu/hr ft °F)
<b>Concrete Masonry Units</b>	
80	0.207
85	0.228
90	0.252
95	0.278
100	0.308
105	0.340
110	0.376
115	0.416
120	0.459
125	0.508
130	0.561
135	0.620
140	0.685
145	0.758
150	0.837
<b>Clay Masonry Units</b>	
120	1.25
130	2.25

For SI: 1 pound per cubic foot = 16.0185 kg/m<sup>3</sup>, Btu per hour foot °F = 1.731 W/(m·K).

**TABLE 721.5.1(4)**  
**WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D)**  
**FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES**

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
W36 × 300	2.47	3.33	× 68	0.92	1.21
× 280	2.31	3.12	× 62	0.92	1.14
× 260	2.16	2.92	× 55	0.82	1.02
× 245	2.04	2.76			
× 230	1.92	2.61	W21 × 147	1.83	2.60
× 210	1.94	2.45	× 132	1.66	2.35
× 194	1.80	2.28	× 122	1.54	2.19
× 182	1.69	2.15	× 111	1.41	2.01
× 170	1.59	2.01	× 101	1.29	1.84
× 160	1.50	1.90	× 93	1.38	1.80
× 150	1.41	1.79	× 83	1.24	1.62
× 135	1.28	1.63	× 73	1.10	1.44
			× 68	1.03	1.35
W33 × 241	2.11	2.86	× 62	0.94	1.23
× 221	1.94	2.64	× 57	0.93	1.17
× 201	1.78	2.42	× 50	0.83	1.04
× 152	1.51	1.94	× 44	0.73	0.92
× 141	1.41	1.80			

(continued)

**TABLE 721.5.1(4)—continued**  
**WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D)**  
**FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES**

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
× 130	1.31	1.67	W18 × 119	1.69	2.42
× 118	1.19	1.53	× 106	1.52	2.18
			× 97	1.39	2.01
W30 × 211	2.00	2.74	× 86	1.24	1.80
× 191	1.82	2.50	× 76	1.11	1.60
× 173	1.66	2.28	× 71	1.21	1.59
× 132	1.45	1.85	× 65	1.11	1.47
× 124	1.37	1.75	× 60	1.03	1.36
× 116	1.28	1.65	× 55	0.95	1.26
× 108	1.20	1.54	× 50	0.87	1.15
× 99	1.10	1.42	× 46	0.86	1.09
			× 40	0.75	0.96
W27 × 178	1.85	2.55	× 35	0.66	0.85
× 161	1.68	2.33			
× 146	1.53	2.12	W16 × 100	1.56	2.25
× 114	1.36	1.76	× 89	1.40	2.03
× 102	1.23	1.59	× 77	1.22	1.78
× 94	1.13	1.47	× 67	1.07	1.56
× 84	1.02	1.33	× 57	1.07	1.43
			× 50	0.94	1.26
			× 45	0.85	1.15
W24 × 162	1.85	2.57	× 40	0.76	1.03
× 146	1.68	2.34	× 36	0.69	0.93
× 131	1.52	2.12	× 31	0.65	0.83
× 117	1.36	1.91	× 26	0.55	0.70
× 104	1.22	1.71			
× 94	1.26	1.63	W14 × 132	1.83	3.00
× 84	1.13	1.47	× 120	1.67	2.75
× 76	1.03	1.34	× 109	1.53	2.52
× 99	1.39	2.31	× 30	0.79	1.12
× 90	1.27	2.11	× 26	0.69	0.98
× 82	1.41	2.12	× 22	0.59	0.84
× 74	1.28	1.93	× 19	0.59	0.78
× 68	1.19	1.78	× 17	0.54	0.70
× 61	1.07	1.61	× 15	0.48	0.63
× 53	1.03	1.48	× 12	0.38	0.51
× 48	0.94	1.35			
× 43	0.85	1.22	W8 × 67	1.61	2.55
× 38	0.79	1.09	× 58	1.41	2.26
× 34	0.71	0.98	× 48	1.18	1.91
× 30	0.63	0.87	× 40	1.00	1.63
× 26	0.61	0.79	× 35	0.88	1.44
× 22	0.52	0.68	× 31	0.79	1.29

(continued)

**TABLE 721.5.1(4)—continued**  
**WEIGHT-TO-HEATED-PERIMETER RATIOS (W/D)**  
**FOR TYPICAL WIDE FLANGE BEAM AND GIRDER SHAPES**

STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE	STRUCTURAL SHAPE	CONTOUR PROFILE	BOX PROFILE
			× 28	0.80	1.24
W12 × 87	1.44	2.34	× 24	0.69	1.07
× 79	1.32	2.14	× 21	0.66	0.96
× 72	1.20	1.97	× 18	0.57	0.84
× 65	1.09	1.79	× 15	0.54	0.74
× 58	1.08	1.69	× 13	0.47	0.65
× 53	0.99	1.55	× 10	0.37	0.51
× 50	1.04	1.54			
× 45	0.95	1.40	W6 × 25	0.82	1.33
× 40	0.85	1.25	× 20	0.67	1.09
× 35	0.79	1.11	× 16	0.66	0.96
× 30	0.69	0.96	× 15	0.51	0.83
× 26	0.60	0.84	× 12	0.51	0.75
× 22	0.61	0.77	× 9	0.39	0.57
× 19	0.53	0.67			
× 16	0.45	0.57	W5 × 19	0.76	1.24
× 14	0.40	0.50	× 16	0.65	1.07
W10 × 112	2.14	3.38	W4 × 13	0.65	1.05
× 100	1.93	3.07			
× 88	1.70†	2.75			
× 77	1.52	2.45			
× 68	1.35	2.20			
× 60	1.20	1.97			
× 54	1.09	1.79			
× 49	0.99	1.64			
× 45	1.03	1.59			
× 39	0.94	1.40			
× 33	0.77	1.20			

For SI: Pounds per linear foot per inch = 0.059 kg/m/mm.



**TABLE 721.5.1(5)**  
**FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS**

COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY $T_e$ (inches)				COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY $T_e$ (inches)			
		1-hour	2-hour	3-hour	4-hour			1-hour	2-hour	3-hour	4-hour
W14 × 82	80	0.74	1.61	2.36	3.04	W10 × 68	80	0.72	1.58	2.33	3.01
	100	0.89	1.85	2.67	3.40		100	0.87	1.83	2.65	3.38
	110	0.96	1.97	2.81	3.57		110	0.94	1.95	2.79	3.55
	120	1.03	2.08	2.95	3.73		120	1.01	2.06	2.94	3.72
W14 × 68	80	0.83	1.70	2.45	3.13	W10 × 54	80	0.88	1.76	2.53	3.21
	100	0.99	1.95	2.76	3.49		100	1.04	2.01	2.83	3.57
	110	1.06	2.06	2.91	3.66		110	1.11	2.12	2.98	3.73
	120	1.14	2.18	3.05	3.82		120	1.19	2.24	3.12	3.90
W14 × 53	80	0.91	1.81	2.58	3.27	W10 × 45	80	0.92	1.83	2.60	3.30
	100	1.07	2.05	2.88	3.62		100	1.08	2.07	2.90	3.64
	110	1.15	2.17	3.02	3.78		110	1.16	2.18	3.04	3.80
	120	1.22	2.28	3.16	3.94		120	1.23	2.29	3.18	3.96
W14 × 43	80	1.01	1.93	2.71	3.41	W10 × 33	80	1.06	2.00	2.79	3.49
	100	1.17	2.17	3.00	3.74		100	1.22	2.23	3.07	3.81
	110	1.25	2.28	3.14	3.90		110	1.30	2.34	3.20	3.96
	120	1.32	2.38	3.27	4.05		120	1.37	2.44	3.33	4.12
W12 × 72	80	0.81	1.66	2.41	3.09	W8 × 40	80	0.94	1.85	2.63	3.33
	100	0.91	1.88	2.70	3.43		100	1.10	2.10	2.93	3.67
	110	0.99	1.99	2.84	3.60		110	1.18	2.21	3.07	3.83
	120	1.06	2.10	2.98	3.76		120	1.25	2.32	3.20	3.99
W12 × 58	80	0.88	1.76	2.52	3.21	W8 × 31	80	1.06	2.00	2.78	3.49
	100	1.04	2.01	2.83	3.56		100	1.22	2.23	3.07	3.81
	110	1.11	2.12	2.97	3.73		110	1.29	2.33	3.20	3.97
	120	1.19	2.23	3.11	3.89		120	1.36	2.44	3.33	4.12
W12 × 50	80	0.91	1.81	2.58	3.27	W8 × 24	80	1.14	2.09	2.89	3.59
	100	1.07	2.05	2.88	3.62		100	1.29	2.31	3.16	3.90
	110	1.15	2.17	3.02	3.78		110	1.36	2.42	3.28	4.05
	120	1.22	2.28	3.16	3.94		120	1.43	2.52	3.41	4.20
W12 × 40	80	1.01	1.94	2.72	3.41	W8 × 18	80±	1.22	2.20	3.01	3.72
	100	1.17	2.17	3.01	3.75		100	1.36	2.40	3.25	4.01
	110	1.25	2.28	3.14	3.90		110	1.42	2.50	3.37	4.14
	120	1.32	2.39	3.27	4.06		120	1.48	2.59	3.49	4.28
4 × 4 × 1/2 wall thickness	80	0.93	1.90	2.71	3.43	4 double extra strong 0.674 wall thickness	80	0.80	1.75	2.56	3.28
	100	1.08	2.13	2.99	3.76		100	0.95	1.99	2.85	3.62
	110	1.16	2.24	3.13	3.91		110	1.02	2.10	2.99	3.78
	120	1.22	2.34	3.26	4.06		120	1.09	2.20	3.12	3.93
4 × 4 × 3/8 wall thickness	80	1.05	2.03	2.84	3.57	4 extra strong 0.337 wall thickness	80	1.12	2.11	2.93	3.65
	100	1.20	2.25	3.11	3.88		100	1.26	2.32	3.19	3.95
	110	1.27	2.35	3.24	4.02		110	1.33	2.42	3.31	4.09
	120	1.34	2.45	3.37	4.17		120	1.40	2.52	3.43	4.23

(continued)

**TABLE 721.5.1(5)—(continued)**  
**FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS**

COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY $T_e$ (inches)				COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY $T_e$ (inches)			
		1-hour	2-hour	3-hour	4-hour			1-hour	2-hour	3-hour	4-hour
$4 \times 4 \times \frac{1}{4}$ wall thickness	80	1.21	2.20	3.01	3.73	4 standard 0.237 wall thickness	80	1.26	2.25	3.07	3.79
	100	1.35	2.40	3.26	4.02		100	1.40	2.45	3.31	4.07
	110	1.41	2.50	3.38	4.16		110	1.46	2.55	3.43	4.21
	120	1.48	2.59	3.50	4.30		120	1.53	2.64	3.54	4.34
$6 \times 6 \times \frac{1}{2}$ wall thickness	80	0.82	1.75	2.54	3.25	5 double extra strong 0.750 wall thickness	80	0.70	1.61	2.40	3.12
	100	0.98	1.99	2.84	3.59		100	0.85	1.86	2.71	3.47
	110	1.05	2.10	2.98	3.75		110	0.91	1.97	2.85	3.63
	120	1.12	2.21	3.11	3.91		120	0.98	2.02	2.99	3.79
$6 \times 6 \times \frac{3}{8}$ wall thickness	80	0.96	1.91	2.71	3.42	5 extra strong 0.375 wall thickness	80	1.04	2.01	2.83	3.54
	100	1.12	2.14	3.00	3.75		100	1.19	2.23	3.09	3.85
	110	1.19	2.25	3.13	3.90		110	1.26	2.34	3.22	4.00
	120	1.26	2.35	3.26	4.05		120	1.32	2.44	3.34	4.14
$6 \times 6 \times \frac{1}{4}$ wall thickness	80	1.14	2.11	2.92	3.63	5 standard 0.258 wall thickness	80	1.20	2.19	3.00	3.72
	100	1.29	2.32	3.18	3.93		100	1.34	2.39	3.25	4.00
	110	1.36	2.43	3.30	4.08		110	1.41	2.49	3.37	4.14
	120	1.42	2.52	3.43	4.22		120	1.47	2.58	3.49	4.28
$8 \times 8 \times \frac{1}{2}$ wall thickness	80	0.77	1.66	2.44	3.13	6 double extra strong 0.864 wall thickness	80	0.59	1.46	2.23	2.92
	100	0.92	1.91	2.75	3.49		100	0.73	1.71	2.54	3.29
	110	1.00	2.02	2.89	3.66		110	0.80	1.82	2.69	3.47
	120	1.07	2.14	3.03	3.82		120	0.86	1.93	2.83	3.63
$8 \times 8 \times \frac{3}{8}$ wall thickness	80	0.91	1.84	2.63	3.33	6 extra strong 0.432 wall thickness	80	0.94	1.90	2.70	3.42
	100	1.07	2.08	2.92	3.67		100	1.10	2.13	2.98	3.74
	110	1.14	2.19	3.06	3.83		110	1.17	2.23	3.11	3.89
	120	1.21	2.29	3.19	3.98		120	1.24	2.34	3.24	4.04
$8 \times 8 \times \frac{1}{4}$ wall thickness	80	1.10	2.06	2.86	3.57	6 standard 0.280 wall thickness	80	1.14	2.12	2.93	3.64
	100	1.25	2.28	3.13	3.87		100	1.29	2.33	3.19	3.94
	110	1.32	2.38	3.25	4.02		110	1.36	2.43	3.31	4.08
	120	1.39	2.48	3.38	4.17		120	1.42	2.53	3.43	4.22

For SI: 1 inch = 25.4 mm, 1 pound per cubic foot = 16.02 kg/m<sup>3</sup>.

Note: Tabulated values assume 1-inch air gap between masonry and steel section.

**TABLE 721.5.1(6)**  
**FIRE RESISTANCE OF CLAY MASONRY PROTECTED STEEL COLUMNS**

COLUMN SIZE	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY $T_e$ (inches)				COLUMN SIZE	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY $T_e$ (inches)			
		1-hour	2-hour	3-hour	4-hour			1-hour	2-hour	3-hour	4-hour
W14 × 82	120	1.23	2.42	3.41	4.29	W10 × 68	120	1.27	2.46	3.26	4.35
	130	1.40	2.70	3.78	4.74		130	1.44	2.75	3.83	4.80
W14 × 68	120	1.34	2.54	3.54	4.43	W10 × 54	120	1.40	2.61	3.62	4.51
	130	1.51	2.82	3.91	4.87		130	1.58	2.89	3.98	4.95
W14 × 53	120	1.43	2.65	3.65	4.54	W10 × 45	120	1.44	2.66	3.67	4.57
	130	1.61	2.93	4.02	4.98		130	1.62	2.95	4.04	5.01
W14 × 43	120	1.54	2.76	3.77	4.66	W10 × 33	120	1.59	2.82	3.84	4.73
	130	1.72	3.04	4.13	5.09		130	1.77	3.10	4.20	5.13
W12 × 72	120	1.32	2.52	3.51	4.40	W8 × 40	120	1.47	2.70	3.71	4.61
	130	1.50	2.80	3.88	4.84		130	1.65	2.98	4.08	5.04
W12 × 58	120	1.40	2.61	3.61	4.50	W8 × 31	120	1.59	2.82	3.84	4.73
	130	1.57	2.89	3.98	4.94		130	1.77	3.10	4.20	5.17
W12 × 50	120	1.43	2.65	3.66	4.55	W8 × 24	120	1.66	2.90	3.92	4.82
	130	1.61	2.93	4.02	4.99		130	1.84	3.18	4.28	5.25
W12 × 40	120	1.54	2.77	3.78	4.67	W8 × 18	120	1.75	3.00	4.01	4.91
	130	1.72	3.05	4.14	5.10		130	1.93	3.27	4.37	5.34
<b>STEEL TUBING</b>						<b>STEEL PIPE</b>					
NOMINAL TUBE SIZE (inches)	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY $T_e$ (inches)				NOMINAL PIPE SIZE (inches)	CLAY MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CLAY MASONRY PROTECTION ASSEMBLY $T_e$ (inches)			
		1-hour	2-hour	3-hour	4-hour			1-hour	2-hour	3-hour	4-hour
4 × 4 × 1/2 wall thickness	120	1.44	2.72	3.76	4.68	4 double extra strong 0.674 wall thickness	120	1.26	2.55	3.60	4.52
	130	1.62	3.00	4.12	5.11		130	1.42	2.82	3.96	4.95
4 × 4 × 3/8 wall thickness	120	1.56	2.84	3.88	4.78	4 extra strong 0.337 wall thickness	120	1.60	2.89	3.92	4.83
	130	1.74	3.12	4.23	5.21		130	1.77	3.16	4.28	5.25
4 × 4 × 1/4 wall thickness	120	1.72	2.99	4.02	4.92	4 standard 0.237 wall thickness	120	1.74	3.02	4.05	4.95
	130	1.89	3.26	4.37	5.34		130	1.92	3.29	4.40	5.37
6 × 6 × 1/2 wall thickness	120	1.33	2.58	3.62	4.52	5 double extra strong 0.750 wall thickness	120	1.17	2.44	3.48	4.40
	130	1.50	2.86	3.98	4.96		130	1.33	2.72	3.84	4.83
6 × 6 × 3/8 wall thickness	120	1.48	2.74	3.76	4.67	5 extra strong 0.375 wall thickness	120	1.55	2.82	3.85	4.76
	130	1.65	3.01	4.13	5.10		130	1.72	3.09	4.21	5.18
6 × 6 × 1/4 wall thickness	120	1.66	2.91	3.94	4.84	5 standard 0.258 wall thickness	120	1.71	2.97	4.00	4.90
	130	1.83	3.19	4.30	5.27		130	1.88	3.24	4.35	5.32
8 × 8 × 1/2 wall thickness	120	1.27	2.50	3.52	4.42	6 double extra strong 0.864 wall thickness	120	1.04	2.28	3.32	4.23
	130	1.44	2.78	3.89	4.86		130	1.19	2.60	3.68	4.67
8 × 8 × 3/8 wall thickness	120	1.43	2.67	3.69	4.59	6 extra strong 0.432 wall thickness	120	1.45	2.71	3.75	4.65
	130	1.60	2.95	4.05	5.02		130	1.62	2.99	4.10	5.08
8 × 8 × 1/4 wall thickness	120	1.62	2.87	3.89	4.78	6 standard 0.280 wall thickness	120	1.65	2.91	3.94	4.84
	130	1.79	3.14	4.24	5.21		130	1.82	3.19	4.30	5.27

**TABLE 721.5.1(7)**  
**MINIMUM COVER (inch) FOR STEEL COLUMNS**  
**ENCASED IN NORMAL-WEIGHT CONCRETE<sup>a</sup>**  
**[FIGURE 721.5.1(6)(c)]**

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)					
	1	1½	2	3	4	
W14 × 233	1	1	1	1½	2	
× 176					2½	
× 132			2	3		
× 90					1½	2½
× 61						
× 48						
× 43		1½	2½			
W12 × 152	1	1	1	2	2½	
× 96		1½	1½	2½	3	
× 65						
× 50						
× 40						
W10 × 88	1	1½	1½	2	3	
× 49	1			2½		3½
× 45						
× 39						
× 33						
W8 × 67	1	1	1½	2½	3	
× 58		1½			2	3
× 48						
× 31						
× 21						
× 18		4				
W6 × 25	1	1½	2	3	3½	
× 20		2	2½		3½	4
× 16						
× 15						
× 9		1½				

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 721.5.1(2).

**TABLE 721.5.1(8)**  
**MINIMUM COVER (inch) FOR STEEL COLUMNS**  
**ENCASED IN STRUCTURAL LIGHTWEIGHT CONCRETE<sup>a</sup>**  
**[FIGURE 721.5.1 (6)(c)]**

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (HOURS)				
	1	1½	2	3	4
W14 × 233	1	1	1	1	1½
× 193				1½	2
× 74					
× 61			1½	2	2½
× 43					
W12 × 65	1	1	1	1½	2
× 53			1½	2	2½
× 40					
W10 × 112	1	1	1	1½	2
× 88			1½	2	2½
× 60					
× 33					
W8 × 35	1	1	1½	2	2½
× 28				2½	3
× 24					
× 18		1½			

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 721.5.1(2).



# FIRE AND SMOKE PROTECTION FEATURES

**TABLE 721.5.1(9)**  
**MINIMUM COVER (inch) FOR STEEL COLUMNS**  
**IN NORMAL-WEIGHT PRECAST COVERS<sup>a</sup>**  
**[FIGURE 721.5.1 (6)(a)]**

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)					
	1	1½	2	3	4	
W14 × 233	1½	1½	1½	2½	3	
× 211			2		3½	
× 176				3		
× 145		2	4			
× 109						3½
× 99			4			
× 61				4½		
× 43						
W12 × 190	1½	1½	1½	2½	3½	
× 152			2		4	
× 120				3		
× 96		2	3½			4½
× 87						
× 58						
× 40						
W10 × 112			1½	1½	2	3
× 88	2	2½		3½	4½	
× 77						
× 54						
× 33						
W8 × 67	1½	1½	2	3	4	
× 58		2	2½	3½		
× 48						
× 28					4½	
× 21		2½	3	4		
× 18						
W6 × 25	1½	2	2½	3½	4½	
× 20		2½	3			4
× 16						
× 12						
× 9	2				5	

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of normal-weight concrete given in Table 72 1.5.1(2).

**TABLE 721.5.1(10)**  
**MINIMUM COVER (inch) FOR STEEL COLUMNS**  
**IN STRUCTURAL LIGHTWEIGHT PRECAST COVERS<sup>a</sup>**  
**[FIGURE 721 .5.1(6)(a)]**

STRUCTURAL SHAPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4
W14 × 233	1½	1½	1½	2	2½
× 176				2½	3
× 145					
× 132					
× 109					
× 99			2	3½	
× 68					
× 43			3		
W12 × 190	1½	1½	1½	2	2½
× 152				2½	3
× 136					
× 106					2
× 96					
× 87					
× 65					
× 40			3		
W10 × 112	1½	1½	2	3	
× 100			2½		
× 88				2	3½
× 77					
× 60					
× 39		3			
× 33		2			
W8 × 67	1½	1½	1½	2½	3
× 48			2	3	3½
× 35					
× 28					
× 18		2	2½	4	
W6 × 25	1½	2	2	3	3½
× 15			2½	3½	4
× 9					

For SI: 1 inch = 25.4 mm.

a. The tabulated thicknesses are based upon the assumed properties of structural lightweight concrete given in Table 72 1.5.1(2).

**721.5.2.2.1 Minimum thickness.** The use of Equation 7-17 is subject to the following conditions:

1. The weight-to-heated-perimeter ratio for the substitute beam or girder ( $W_2/D_2$ ) shall not be less than 0.37.
2. The thickness of fire protection materials for the substitute beam or girder ( $T_1$ ) shall not be less than  $\frac{3}{8}$  inch (9.5 mm).
3. The unrestrained or restrained beam rating shall not be less than 1 hour.
4. When used to adjust the material thickness for a restrained beam, the use of this procedure is limited to steel sections classified as compact in accordance with AISC 360.

**721.5.2.3 Structural steel trusses.** The fire resistance of structural steel trusses protected with fire-resistant materials spray applied to each of the individual truss elements shall be permitted to be determined in accordance with this section. The thickness of the fire-resistant material shall be determined in accordance with Section 721.5.1.3. The weight-to-heated-perimeter ratio ( $W/D$ ) of truss elements which can be simultaneously exposed to fire on all sides shall be determined on the same basis as columns, as specified in Section 721.5.1.1. The weight-to-heated-perimeter ratio ( $W/D$ ) of truss elements which directly support floor or roof assembly shall be determined on the same basis as beams and girders, as specified in Section 721.5.2.1.

**Exception:** The fire resistance of structural steel trusses protected with intumescent or mastic fire-resistant coatings shall be determined on the basis of fire-resistance tests in accordance with Section 703.2.

**721.6 Wood assemblies.** The provisions of this section contain procedures by which the fire-resistance ratings of wood assemblies are established by calculations.

**721.6.1 General.** This section contains procedures for calculating the fire-resistance ratings of walls, floor/ceiling and roof/ceiling assemblies based in part on the standard method of testing referenced in Section 703.2.

**721.6.1.1 Maximum fire-resistance rating.** Fire-resistance ratings calculated for assemblies using the methods in Section 721.6 shall be limited to a maximum of 1 hour.

**721.6.1.2 Dissimilar membranes.** Where dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.

**721.6.2 Walls, floors and roofs.** These procedures apply to both load-bearing and nonload-bearing assemblies.

**721.6.2.1 Fire-resistance rating of wood frame assemblies.** The fire-resistance rating of a wood frame

assembly is equal to the sum of the time assigned to the membrane on the fire-exposed side, the time assigned to the framing members and the time assigned for additional contribution by other protective measures such as insulation. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly.

**721.6.2.2 Time assigned to membranes.** Table 721.6.2(1) indicates the time assigned to membranes on the fire-exposed side.

**721.6.2.3 Exterior walls.** For an exterior wall with a fire separation distance greater than 5 feet (1524 mm), the wall is assigned a rating dependent on the interior membrane and the framing as described in Tables 721.6.2(1) and 721.6.2(2). The membrane on the outside of the nonfire-exposed side of exterior walls with a fire separation distance greater than 5 feet (1524 mm) may consist of sheathing, sheathing paper, and siding as described in Table 721.6.2(3).

**TABLE 721.6.2(1)**  
**TIME ASSIGNED TO WALLBOARD MEMBRANES<sup>a, b, c, d</sup>**

DESCRIPTION OF FINISH	TIME <sup>a</sup> (minutes)
$\frac{3}{8}$ -inch wood structural panel bonded with exterior glue	5
$\frac{15}{32}$ -inch wood structural panel bonded with exterior glue	10
$\frac{19}{32}$ -inch wood structural panel bonded with exterior glue	15
$\frac{3}{8}$ -inch gypsum wallboard	10
$\frac{1}{2}$ -inch gypsum wallboard	15
$\frac{5}{8}$ -inch gypsum wallboard	30
$\frac{1}{2}$ -inch Type X gypsum wallboard	25
$\frac{5}{8}$ -inch Type X gypsum wallboard	40
Double $\frac{3}{8}$ -inch gypsum wallboard	25
$\frac{1}{2}$ - + $\frac{3}{8}$ -inch gypsum wallboard	35
Double $\frac{1}{2}$ -inch gypsum wallboard	40

For SI: 1 inch = 25.4 mm.

- a. These values apply only when membranes are installed on framing members which are spaced 16 inches o.c.
- b. Gypsum wall board installed over framing or furring shall be installed so that all edges are supported, except  $\frac{5}{8}$ -inch Type X gypsum wallboard shall be permitted to be installed horizontally with the horizontal joints staggered 24 inches each side and unsupported but finished.
- c. On wood frame floor/ceiling or roof/ceiling assemblies, gypsum board shall be installed with the long dimension perpendicular to framing members and shall have all joints finished.
- d. The membrane on the unexposed side shall not be included in determining the fire resistance of the assembly. When dissimilar membranes are used on a wall assembly, the calculation shall be made from the least fire-resistant (weaker) side.
- e. The time assigned is not a finished rating.

## FIRE AND SMOKE PROTECTION FEATURES

**TABLE 721.6.2(2)**  
**TIME ASSIGNED FOR CONTRIBUTION OF WOOD FRAME<sup>a, b, c</sup>**

DESCRIPTION	TIME ASSIGNED TO FRAME (minutes)
Wood studs 16 inches o.c.	20
Wood floor and roof joists 16 inches o.c.	10

For SI: 1 inch = 25.4 mm.

- a. This table does not apply to studs or joists spaced more than 16 inches o.c.  
b. All studs shall be nominal  $2 \times 4$  and all joists shall have a nominal thickness of at least 2 inches.  
c. Allowable spans for joists shall be determined in accordance with Sections 2308.8, 2308.10.2 and 2308.10.3.

**721.6.2.4 Floors and roofs.** In the case of a floor or roof, the standard test provides only for testing for fire exposure from below. Except as noted in Section 703.3, Item 5, floor or roof assemblies of wood framing shall have an upper membrane consisting of a sub-floor and finished floor conforming to Table 721.6.2(4) or any other membrane that has a contribution to fire resistance of at least 15 minutes in Table 721.6.2(1).

**721.6.2.5 Additional protection.** Table 721.6.2(5) indicates the time increments to be added to the fire resistance where glass fiber, rock wool, slag mineral wool, or cellulose insulation is incorporated in the assembly.

**721.6.2.6 Fastening.** Fastening of wood frame assemblies and the fastening of membranes to the wood framing members shall be done in accordance with Chapter 23.

**721.6.3 Design of fire-resistant exposed wood members.** The fire-resistance rating, in minutes, of timber beams and columns with a minimum nominal dimension of 6 inches (152 mm) is equal to:

Beams:  $2.54Zb (4 - 2(b/d))$  for beams which may be exposed to fire on four sides.  
**(Equation 7-18)**

$2.54Zb (4 - (b/d))$  for beams which may be exposed to fire on three sides.  
**(Equation 7-19)**

Columns:  $2.54Zd (3 - (d/b))$  for columns which may be exposed to fire on four sides.  
**(Equation 7-20)**

**TABLE 721.6.2(3)**  
**MEMBRANE<sup>a</sup> ON EXTERIOR FACE OF WOOD STUD WALLS**

SHEATHING	PAPER	EXTERIOR FINISH
<b>NYC</b> $\frac{5}{8}$ -inch T & G lumber $\frac{5}{16}$ -inch exterior glue plywood $\frac{1}{2}$ -inch gypsum wallboard $\frac{5}{8}$ -inch gypsum wallboard $\frac{1}{2}$ -inch fiberboard	Sheathing paper	Lumber siding Wood shingles and shakes $\frac{1}{4}$ -inch wood structural panels—exterior type $\frac{1}{4}$ -inch hardboard Metal siding Stucco on metal lath Masonry veneer Vinyl siding
None	—	$\frac{3}{8}$ -inch exterior-grade wood structural panels

For SI: 1 inch = 25.4 mm.†

- a. Any combination of sheathing, paper, and exterior finish is permitted.

**TABLE 721.6.2(4)**  
**FLOORING OR ROOFING OVER WOOD FRAMING<sup>a</sup>**

ASSEMBLY	STRUCTURAL MEMBERS	SUBFLOOR OR ROOF DECK	FINISHED FLOORING OR ROOFING
Floor	Wood	$\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood	Hardwood or softwood flooring on building paper resilient flooring, parquet floor felted-synthetic fiber floor coverings, carpeting, or ceramic tile on $\frac{3}{8}$ -inch-thick panel-type underlay Ceramic tile on $1\frac{1}{4}$ -inch mortar bed
Roof	Wood	$\frac{15}{32}$ -inch wood structural panels or $\frac{11}{16}$ -inch T & G softwood	Finished roofing material with or without insulation

For SI: 1 inch = 25.4 mm.

- a. This table applies only to wood joist construction. It is not applicable to wood truss construction.

**TABLE 721.6.2(5)**  
**TIME ASSIGNED FOR ADDITIONAL PROTECTION**

DESCRIPTION OF ADDITIONAL PROTECTION	FIRE RESISTANCE (minutes)
Add to the fire-resistance rating of wood stud walls if the spaces between the studs are completely filled with glass fiber mineral wool batts weighing not less than 2 pounds per cubic foot (0.6 pound per square foot of wall surface) or rockwool or slag material wool batts weighing not less than 3.3 pounds per cubic foot (1 pound per square foot of wall surface), or cellulose insulation having a nominal density not less than 2.6 pounds per cubic foot.	15

For SI: 1 pound/cubic foot = 16.0185 kg/m<sup>3</sup>.

$2.54Zd (3 -(d/2b))$  for columns which may be exposed to fire on three sides.

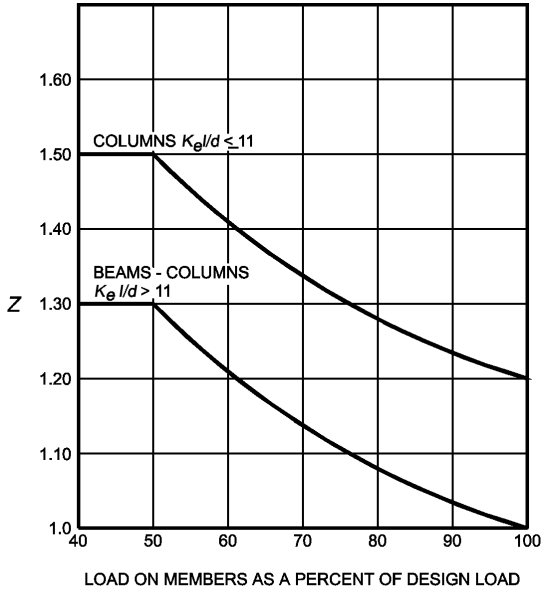
(Equation 7-21)

where:

$b$  = The breadth (width) of a beam or larger side of a column before exposure to fire (inches).

$d$  = The depth of a beam or smaller side of a column before exposure to fire (inches).

$Z$  = Load factor, based on Figure 721.6.3(1).‡



$K_e$  = The effective length factor as noted in Figure 721.6.3(2).  
 $l$  = The unsupported length of columns (inches).

FIGURE 721.6.3(1)  
LOAD FIGURE

BUCKLING MODES						
THEORETICAL $K_e$ VALUE	0.5	0.7	1.0	1.0	2.0	2.0
RECOMMENDED DESIGN $K_e$ WHEN IDEAL CONDITIONS APPROXIMATED	0.65	0.80	1.2	1.0	2.10	2.4
END CONDITION CODE		ROTATION FIXED, TRANSLATION FIXED				
		ROTATION FREE, TRANSLATION FIXED				
		ROTATION FIXED, TRANSLATION FREE				
		ROTATION FREE, TRANSLATION FREE				

FIGURE 721.6.3(2)  
EFFECTIVE LENGTH FACTORS

**721.6.3.1 Equation 7-21.** Equation 7-21 applies only where the unexposed face represents the smaller side of the column. If a column is recessed into a wall, its

full dimension shall be used for the purpose of these calculations.

**721.6.3.2 Allowable loads.** Allowable loads on beams and columns are determined using design values given in AF&PA NDS.‡

**721.6.3.3 Fastener protection.** Where minimum 1-hour fire resistance is required, connectors and fasteners shall be protected from fire exposure by 1½ inches (38 mm) of wood, or other approved covering or coating for a 1-hour rating. Typical details for commonly used fasteners and connectors are shown in AITC Technical Note 7.

**721.6.3.4 Minimum size.** Wood members are limited to dimensions of 6 inches (152 mm) nominal or greater. Glued-laminated timber beams utilize standard laminating combinations except that a core lamination is removed. The tension zone is moved inward and the equivalent of an extra nominal 2-inch-thick (51 mm) outer tension lamination is added.

**721.7 Other reference documents.** Refer to Section 703.3, Item 1, and NBS BMS 71 and NBS TRBM 44 for fire-resistance ratings of materials and assemblies.

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## CHAPTER 8

# INTERIOR FINISHES

### SECTION BC 801 GENERAL

**801.1 Scope.** Provisions of this chapter shall govern the use of materials used as interior finishes, trim and decorative materials.

**NYC 801.2 Interior wall and ceiling finish.** The provisions of Section 803 shall limit the fire performance and smoke development of interior wall and ceiling finish materials based on occupancy classification.

**801.3 Interior floor finish.** The provisions of Section 804 shall limit the allowable fire performance of interior floor finish materials based on occupancy classification.

**801.4 Decorative materials and trim.** Decorative materials and trim shall be restricted by combustibility and the flame propagation performance criteria of NFPA 701, in accordance with Section 806.

**NYC NYC 801.5 Applicability in flood hazard areas.** For buildings in flood hazard areas as established in Appendix G, interior finishes, trim and decorative materials below the design flood elevation shall be flood-damage-resistant materials.

**NYC NYC 801.6 Application.** Combustible materials complying with the requirements of this chapter shall be permitted to be used as finish for walls, ceilings, floors and other interior surfaces of buildings.

**NYC NYC 801.7 Windows.** Show windows in the first story of buildings shall be permitted to be of wood or of unprotected metal framing.

**801.8 Foam plastics.** Foam plastics shall not be used as interior finish except as provided in Section 803.4. Foam plastics shall not be used as interior trim except as provided in Section 806.3 or 2604.2. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

### SECTION BC 802 DEFINITIONS

**802.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**EXPANDED VINYL WALL COVERING.** Wall covering consisting of a woven textile backing, an expanded vinyl base coat layer and a non-expanded vinyl skin coat. The expanded base coat layer is a homogeneous vinyl layer that contains a blowing agent. During processing, the blowing agent decomposes, causing this layer to expand by forming closed cells. The total thickness of the wall covering is approximately 0.055 inch to 0.070 inch (1.4 mm to 1.8 mm).

**NYC 801.2 Interior wall and ceiling finish.** The provisions of Section 803 shall limit the fire performance and smoke development of interior wall and ceiling finish materials based on occupancy classification.

**FLAME SPREAD.** The propagation of flame over a surface.

**FLAME SPREAD INDEX.** A comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E 84 or UL 723.‡

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**INTERIOR FINISH.** Interior finish includes interior wall and ceiling finish and interior floor finish.

**INTERIOR FLOOR FINISH.** The exposed floor surfaces of buildings including coverings applied over a finished floor or stair, including risers.

**INTERIOR FLOOR-WALL BASE.** Interior floor finish trim used to provide a functional and/or decorative border at the intersection of walls and floors.

**INTERIOR WALL AND CEILING FINISH.** The exposed interior surfaces of buildings including, but not limited to: fixed or movable walls and partitions; toilet room privacy partitions; columns; ceilings; and interior wainscoting, paneling or other finish applied structurally or for decoration, acoustical correction, surface insulation, structural fire resistance or similar purposes, but not including trim.

**SITE-FABRICATED STRETCH SYSTEM.** A system, fabricated on site and intended for acoustical, tackable or aesthetic purposes, that is comprised of three elements: (a) a frame (constructed of plastic, wood, metal or other material) used to hold fabric in place, (b) a core material (infill, with the correct properties for the application), and (c) an outside layer, comprised of a textile, fabric or vinyl, that is stretched taut and held in place by tension or mechanical fasteners via the frame.

**SMOKE-DEVELOPED INDEX.** A comparative measure, expressed as a dimensionless number, derived from measurements of smoke obscuration versus time for a material tested in accordance with ASTM E 84.

**TRIM.** Picture molds, chair rails, baseboards, handrails, door and window frames and similar decorative or protective materials used in fixed applications.

### SECTION BC 803 WALL AND CEILING FINISHES

**803.1 General.** Interior wall and ceiling finish materials shall be accepted as compliant for fire performance and smoke development in accordance with Section 803.1.1 or Section 803.1.2, and installed in accordance with the criteria therein. Materials tested in accordance with Section 803.1.2 shall not be required to be tested in accordance with Section 803.1.1.

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#### Exceptions:

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- 1. Thickness exemption.** Materials having a thickness less than 0.036 inch (0.9 mm) applied directly to the surface of walls or ceilings shall not be required to be tested.

- 2014 NEW YORK CITY BUILDING CODE

finish shall comply with Item 2. During the entire test, the interior finish shall comply with Item 3.

1. During the 40 kW exposure, flames shall not spread to the ceiling.
2. During the 150 kW exposure, the interior finish shall comply with the following:
  - 2.1. Flame shall not spread to the outer extremities of the samples on the 8-foot by 12-foot (203 mm by 305 mm) walls.
  - 2.2. Flashover, as described in NFPA 265, shall not occur.
3. The total smoke released throughout the NFPA 265 test shall not exceed 10,764 square feet† (1,000 m²).

**803.1.4 Flame-spread and smoke-development tests for textile wall or ceiling coverings.** Specimens shall be tested and indexed per ASTM E 84 or UL 723, and classified for flame spread per Section† 803.1.4.1.

**803.1.4.1 Acceptance criteria for textile and expanded vinyl wall or ceiling coverings tested to ASTM E 84 or UL 723.** Textile wall and ceiling coverings and expanded vinyl wall and ceiling coverings shall have a Class A flame spread index per Section† 803.1.1.1; shall meet the smoke-developed index requirements of Section 803.1.1.3†; and shall be protected by an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

**803.2 Stability.** Interior finish materials regulated by this chapter shall be applied or otherwise fastened in such a manner that such materials will not readily become detached where subjected to room temperatures of 200°F (93°C) for not less than 30 minutes.

**803.3 Application of interior finish materials to fire-resistance-rated structural elements.** Where interior finish materials are applied on walls, ceilings or structural elements required to have a fire-resistance rating or to be of noncombustible construction, they shall comply with the provisions of this section.

**803.3.1 Direct attachment and furred construction.** Where walls and ceilings are required by any provision in this code to be of fire-resistance-rated or noncombustible construction, the interior finish material shall be applied directly against such construction or to furring strips not exceeding 1¾ inches (44 mm) applied directly against such surfaces. The intervening spaces between such furring strips shall comply with one of the following:

1. Be filled with material that is inorganic or noncombustible;
2. Be filled with material that meets the requirements of a Class A material in accordance with Section 803.1.1 or 803.1.2; or
3. Be fire blocked at a maximum of 8 feet (2438 mm) in any direction in accordance with Section BC 717.

**803.3.2 Set-out construction.** Where walls and ceilings are required to be of fire-resistance-rated or noncombusti-

ble construction and walls are set out or ceilings are dropped distances greater than specified in Section 803.3.1, Class A finish materials in accordance with Section 803.1.1 or 803.1.2 shall be used except where interior finish materials are protected on both sides by an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 or attached to noncombustible backing or furring strips installed as specified in Section 803.3.1. The hangers and assembly members of such dropped ceilings that are below the main ceiling line shall be of noncombustible materials, except that in Types III and V construction, fire-retardant-treated wood shall be permitted. The construction of each set-out wall shall be of fire-resistance-rated construction as required elsewhere in this code.

**803.3.3 Attachment to heavy timber construction.** Wall and ceiling finishes of all classes as permitted in this chapter that are installed directly against the wood decking or planking of Type IV construction or to wood furring strips applied directly to the wood decking or planking shall be fireblocked as specified in Section 803.3.1.

**803.3.4 Materials.** An interior wall or ceiling finish that is not more than ¼ inch (6.4 mm) thick shall be applied directly against a noncombustible backing.

**Exceptions:**

1. Noncombustible materials.
2. Materials where the qualifying tests were made with the material suspended or furred out from the noncombustible backing.

**803.4 Foam plastics.** Foam plastics shall not be used as interior finish except as provided in Section 2603.9. This section shall apply both to exposed foam plastics and to foam plastics used in conjunction with a textile or vinyl facing or cover.

**803.5 Toxicity.** Interior wall or ceiling finishes, other than textiles, upon exposure to fire, shall not produce products of decomposition or combustion that are more toxic in point of concentration than those given off by wood or paper when decomposing or burning under comparable conditions as tested in accordance with NFPA 269.

**SECTION BC 804  
INTERIOR FLOOR FINISH**

**804.1 General.** Interior floor finish and floor covering materials shall comply with this section.

**804.2 Classification.** Interior floor finish and floor covering materials required by Section 804.4.1 to be of Class I or II materials shall be classified in accordance with NFPA 253 or ASTM E 648. The classification referred to herein corresponds to the classifications determined by NFPA 253 or ASTM E 648 as follows: Class I, 0.45 watts/cm² or greater; Class II, 0.22 watts/cm² or greater.

**804.3 Testing and identification.** Interior floor finish and floor covering materials shall be tested by an approved agency in accordance with NFPA 253 or ASTM E 648 and identified by a hang tag or other suitable method so as to identify the manufacturer or supplier and style, and shall



TABLE 803.1  
INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY<sup>k</sup>

GROUP	SPRINKLERED <sup>l</sup>			NONSPRINKLERED		
	Exit enclosures and exit passageways <sup>a, b</sup>	Corridors	Rooms and enclosed spaces <sup>c</sup>	Exit enclosures and exit passageways <sup>a, b</sup>	Corridors	Rooms and enclosed spaces <sup>c</sup>
A-1 & A-2	B	B	C	A	A <sup>d</sup>	B <sup>e</sup>
A-3 <sup>f</sup> , A-4, A-5	B	B	C	A	A <sup>d</sup>	C
B, E, M, R-1	B	B	B	A	A	B
F	B	C	C	A	B	B
H	B	B	C <sup>g</sup>	A	A	B
I-1	B	C	C	A	B	B
I-2	B	B	B <sup>h, i</sup>	A	A	B
I-3	A	A <sup>j</sup>	C	A	A	B
I-4	B	B	B <sup>h, i</sup>	A	A	B
R-2	B	B	C	A	A	C
R-3	C	C	C	C	C	C
S	B	C	C	A	B	C
U	No restrictions			No restrictions		

For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m<sup>2</sup>.

- Class C interior finish materials shall be permitted for wainscoting or paneling of not more than 1,000 square feet of applied surface area in the grade lobby where applied directly to a noncombustible base or over furring strips applied to a noncombustible base and fireblocked as required by Section 803.3.1.
- In exit enclosures of buildings less than three stories above grade plane of other than Group I-3, Class B interior finish for nonsprinklered buildings and Class C interior finish for sprinklered buildings shall be permitted.
- Requirements for rooms and enclosed spaces shall be based upon spaces enclosed by partitions. Where a fire-resistance rating is required for structural elements, the enclosing partitions shall extend from the floor to the ceiling. Partitions that do not comply with this shall be considered enclosing spaces and the rooms or spaces on both sides shall be considered one. In determining the applicable requirements for rooms and enclosed spaces, the specific occupancy thereof shall be the governing factor regardless of the group classification of the building or structure.
- Lobby areas in Group A-1, A-2 and A-3 occupancies shall not be less than Class B materials.
- Class C interior finish materials shall be permitted in places of assembly with an occupant load of 300 persons or less.
- For churches and places of worship, wood used for ornamental purposes, trusses, paneling or chancel furnishing shall be permitted.
- Class B material is required where the building exceeds two stories.
- Class C interior finish materials shall be permitted in administrative spaces.
- Class C interior finish materials shall be permitted in rooms with a capacity of four persons or less.
- Class B materials shall be permitted as wainscoting extending not more than 48 inches above the finished floor in exit access corridors.
- Finish materials as provided for in other sections of this code.
- Applies when the exit enclosures, exit passageways, corridors, or rooms and enclosed spaces are protected by a sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

indicate the interior floor finish or floor covering classification according to Section 804.2. Carpet-type floor coverings shall be tested as proposed for use, including underlayment. Test reports confirming the information provided in the manufacturer's product identification shall be furnished to the department upon request.

**804.4 Interior floor finish limitations.** In buildings and spaces classified in Occupancy Group H and in all exits and exit passageways of any occupancy group, floor finishes shall be of noncombustible materials.

**Exception:** Interior floor finish may be of combustible materials in the following spaces. Carpet-type materials must be able to withstand a minimum critical radiant flux as specified in Section 804.4.1.

- Buildings of Type VB Construction.
- Interior stairs in buildings of Type III, IV and V construction in Occupancy Group B, F, M or S-2, when the buildings are two stories in height or less.

- Interior stairs in buildings of Type III, IV and V construction in Occupancy Groups R-2 and R-3 when the buildings are three stories in height or less.
- Interior stairs in buildings of Type III, IV and V construction in Occupancy Group R-2 when occupied by three families or less.

**804.4.1 Minimum critical radiant flux.** Interior floor finishes shall not be less than Class I in Occupancy Groups I-2 and I-3 and not less than Class II in Occupancy Groups A, B, E, H, I-4, M, R-1, R-2 and S. In all other occupancy groups, the interior floor finish shall comply with the DOC FF-1 "pill test" (CPSC 16 CFR, Part 1630).

**804.5 Volatile organic compounds emissions in carpet and carpet cushion.** On and after July 1, 2013 carpet and carpet cushion as defined in Section 17-1401 of the *Administrative Code* shall comply with the limits on volatile organic com-

NYC pound emissions set forth in Chapter 14 of Title 17 of such  
NYC code.

## SECTION BC 805 COMBUSTIBLE FLOORING MATERIALS IN TYPES I AND II CONSTRUCTION

**805.1 Application.** Combustible materials installed on or embedded in floors of buildings of Type I or II construction shall comply with Sections 805.1.1 through 805.1.4.

**Exception:** Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.

**805.1.1 Subfloor construction.** Floor sleepers, bucks and nailing blocks shall not be constructed of combustible materials, unless the space between the fire-resistance-rated floor assembly and the flooring is either solidly filled with noncombustible materials or fireblocked in accordance with Section 717, and provided that such open spaces shall not extend under or through permanent partitions or walls.

**805.1.2 Wood finish flooring.** Wood finish flooring is permitted to be attached directly to the embedded or fireblocked wood sleepers and shall be permitted where cemented directly to the top surface of approved fire-resistance-rated floor assemblies or directly to a wood subfloor attached to sleepers as provided for in Section 805.1.1.

**805.1.3 Insulating boards.** Combustible insulating boards not more than 1/2-inch (12.7 mm) thick and covered with finish flooring are permitted, where attached directly to a noncombustible floor assembly or to wood subflooring attached to sleepers as provided for in Section 805.1.1.

**805.1.4 Carpet-type floor coverings.** Carpet-type floor coverings are permitted where cemented directly to the top surface of approved fire-resistance-rated construction or directly to a wood subfloor attached to sleepers as provided for in Section 805.1.1.

## SECTION BC 806 DECORATIVE MATERIALS AND TRIM

**806.1 Decorations.** All decorations shall comply with the requirements of the *New York City Fire Code*.

**806.2 Reserved.**

**806.3 Foam plastic as trim.** Foam plastic used as trim shall be permitted in Group R-3 occupancies, within individual dwelling units of Group R-1 and R-2 occupancies, and where approved in accordance with the special provisions of Section 2603.9. Foam plastics used as trim in any occupancy shall comply with the requirements of Section 2604.2.

**806.4 Pyroxylin plastic.** Imitation leather or other material consisting of or coated with a pyroxylin or similarly hazardous base shall not be used in Group A occupancies.

**806.5 Interior trim.** Material, other than foam plastic used as interior trim, shall have a minimum Class C flame spread index as described in Section 803.1.1 and maximum smoke-developed index of 450, when tested in accordance with ASTM E 84 or UL 723. Combustible trim, excluding hand-

rails and guardrails, shall not exceed 10 percent of the specific wall or ceiling area in which it is attached.

**806.6 Interior floor-wall base.** Interior floor-wall base that is 6 inches (152 mm) or less in height shall be tested in accordance with Section 804.2 and shall not be less than Class II. Where a Class I floor finish is required, the floor-wall base shall be Class I.

**Exception:** Interior trim materials that comply with Section 806.5.

## SECTION BC 807 INSULATION

**807.1 Insulation.** Thermal and acoustical insulation shall comply with Section 719.

## SECTION BC 808 ACOUSTICAL CEILING SYSTEMS

**808.1 Acoustical ceiling systems.** The quality, design, fabrication and erection of metal suspension systems for acoustical tile and lay-in panel ceilings in buildings or structures shall conform with generally accepted engineering practice, the provisions of this chapter and other applicable requirements of this code.

**808.1.1 Materials and installation.** Acoustical materials complying with the interior finish requirements of Section 803 shall be installed in accordance with the manufacturer's recommendations and applicable provisions for applying interior finish.

**808.1.1.1 Suspended acoustical ceilings.** Acoustical ceilings that are to be suspended below floor or roof construction by means of a framing system shall consist of supporting hangers of minimum 1/4-inch diameter (6.4 mm) steel rods, carrying channels of minimum 1 1/2-inch deep (38 mm) cold-rolled steel weighing 0.457 pounds per linear foot (0.707 kg/m), and a supporting grid complying with Appendix R. Use of wire hangers shall not be permitted. Direct hung suspension systems shall not be permitted.

**Exception:** Acoustical ceiling systems in Group R-2 and R-3 occupancies shall be permitted to be installed in accordance with ASTM C 635 and ASTM C 636 without modifications.

**808.1.1.2 Fire-resistance-rated construction.** Acoustical ceiling systems that are part of fire-resistance-rated construction shall be installed in the same manner used in the assembly tested and shall comply with the provisions of Chapter 7.



## CHAPTER 9

# FIRE PROTECTION SYSTEMS

### SECTION BC 901 GENERAL

**901.1 Scope.** The provisions of this chapter shall specify where fire protection systems are required and shall apply to the design, installation and operation of fire protection systems.

**901.1.1 Referenced standards.** Where this code makes reference to the nationally recognized standards NFPA 13, NFPA 13D, NFPA 13R, NFPA 14, NFPA 20, or NFPA 72, such standard shall be as modified for New York City in accordance with Appendix Q.

**901.2 Fire protection systems.** Fire protection systems shall be installed, repaired, operated and maintained in accordance with this code and the *New York City Fire Code*. Any fire protection system for which an exception or reduction to the provisions of this code has been granted shall be considered to be a required system.

**Exception:** Any fire protection system or portion thereof not required by this code shall be permitted to be installed provided that such system meets the requirements of this code.

**901.3 Modifications.** No person shall remove or modify any fire protection system installed or maintained under the provisions of this code or the *New York City Fire Code* without approval by the commissioner.

**901.4 Threads.** Threads provided for Fire Department connections to sprinkler systems, standpipes, yard hydrants or any other fire hose connection shall be compatible with the connections used by the Fire Department.

**901.5 Acceptance tests.** Fire protection systems shall be tested in accordance with the requirements of this code and the *New York City Fire Code*. When required, the tests shall be conducted in the presence of the department or an approved agency. Tests required by this code, the *New York City Fire Code* and the standards listed in this code shall be conducted at the expense of the owner or the owner's representative. It shall be unlawful to occupy portions of a structure until the required fire protection systems within that portion of the structure have been tested and approved.

**901.6 Supervisory service.** Where required, fire protection systems shall be monitored by a central supervising station in accordance with NFPA 72.

**901.6.1 Automatic sprinkler systems.** Automatic sprinkler systems shall be monitored by a central supervising station.

#### Exceptions:

1. A central supervising station is not required for automatic sprinkler systems protecting one- and two-family dwellings.

2. Limited area sprinkler systems serving fewer than 20 sprinkler heads.

**901.6.2 Fire alarm systems.** Fire alarm systems required by the provisions of Section 907.2 of this code and the *New York City Fire Code* shall be monitored by a central supervising station in accordance with Section 907.14.

#### Exceptions:

1. Single- and multiple-station smoke alarms and carbon monoxide alarms required by Section 907.2.11.
2. Smoke detectors in Group I-3 occupancies.
3. Supervisory service is not required for automatic sprinkler systems in one- and two-family dwellings.

**901.6.3 Group H.** Manual fire alarm, automatic fire-extinguishing and emergency alarm systems in Group H occupancies shall be monitored by an approved supervising station.

**Exception:** When approved by the Fire Department, on-site monitoring at a constantly attended location shall be permitted provided that notifications to the Fire Department will be equal to those provided by a central supervising station.

**901.7 Fire areas.** Where buildings, or portions thereof, are divided into fire areas so as not to exceed the limits established for requiring a fire protection system in accordance with this chapter, such fire areas shall be separated by fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both, having a fire-resistance rating of not less than that determined in accordance with Section 707.3.9.

**901.8 Construction documents.** Construction documents shall comply with Chapter 1 of Title 28 of the *Administrative Code*, Section 107 and other applicable provisions of this code and its referenced standards.

**901.9 Special provisions for prior code buildings.** The provisions of this chapter shall apply to alterations and changes of use or occupancy to prior code buildings in accordance with Sections 901.9.1 through 901.9.6.

**901.9.1 Additions, alterations or repairs.** Additions, alterations, renovations or repairs to existing systems shall conform to that required for new systems without requiring the existing system to comply with all of the requirements of this code, except as otherwise required in Sections 901.9.2 through 901.9.6. Additions, alterations or repairs shall not cause an existing installation to become unsafe, hazardous or overloaded.

**901.9.1.1 Minor additions, alterations, renovations and repairs.** Minor additions, alterations, renovations and repairs to existing systems shall meet the provisions for new construction, unless such work is done in



the same manner and arrangement as was in the existing system, is not hazardous and is approved.

**901.9.2 Additional requirements based on change of occupancy or use.** Fire protection systems governed by this chapter shall be provided:

1. To the entire building as if the building were hereafter erected, where a change is made in the main use or dominant occupancy of such building.
2. Throughout a space, where a change is made in the occupancy group classification or usage of the space.

**901.9.3 Additional requirements for enlargements.** Fire protection systems shall be provided in enlarged portions of a building and where this chapter would require such systems in new construction for a space or building.

**Exception:** Section 901.9.3 shall not require sprinklers to be installed in enlarged portions of unsprinklered buildings to be occupied exclusively as one- or two-family dwellings. This exception shall not apply where sprinklers are otherwise required by the provisions of Sections 901.9.2 or 901.9.4.

**901.9.4 Additional requirements based on value of alterations.** Fire protection systems shall be provided to buildings and spaces in accordance with the provisions of Sections 901.9.4.1 through 901.9.4.3.

**901.9.4.1 Alterations requiring fire protection systems throughout a building.** If the value of alterations to the building equals or exceeds 60 percent of the value of the existing building, or, in the case of a building containing 4 or more dwelling units, 50 percent of the value of the existing building, the entire building shall be made to comply with the fire protection requirements of this chapter as if it were hereafter erected.

**901.9.4.2 Alterations requiring fire protection systems in the space being altered.** If the value of alterations of a space is between 30 percent and 60 percent of the value of the existing building, or, in the case of a building containing 4 or more dwelling units, if the value of alterations of a space is between 30 percent and 50 percent of the value of the existing building, those portions of the building being altered shall be made to comply with the fire protection requirements of this chapter.

**901.9.4.3 Additional requirements for buildings containing 4 or more dwelling units.** For buildings containing 4 or more dwelling units, if the value of alterations to an existing space classified in Occupancy Group R-1 or R-2 exceeds 50 percent of the value of the space, such space shall be made to comply with the fire protection requirements of this chapter.

**901.9.5 Additional provisions.** In buildings or spaces not otherwise required to provide fire protection systems in accordance with this chapter, fire protection systems shall be provided for the types of alterations described in Sections 901.9.5.1 through 901.9.5.4.

**901.9.5.1 Additional requirements for providing smoke and carbon monoxide alarms in dwelling units during alterations involving removal of existing interior finishes.** Smoke and/or carbon monoxide alarms complying with the location, interconnection and power source requirements of this chapter shall be provided throughout a dwelling unit when alteration work results in the removal of existing and/or installation of new interior wall or ceiling finishes permitting the installation of concealed wiring for all the required alarms throughout the dwelling unit.

**901.9.5.2 Additional requirements for providing standpipes in newly constructed stair shafts.** Where an alteration includes the addition or replacement of an entire exit stair shaft that is a required means of egress, the entire shaft shall be equipped with a standpipe in accordance with Section 905.

**901.9.5.3 Additional requirements for enlargements of buildings with existing standpipe systems.** Where the alteration involves the addition of stories to a building with an existing standpipe system, and one or more stair shafts are not currently equipped with standpipes, standpipes shall be provided to all stair shafts in accordance with this chapter.

**Exception:** Additional standpipes are not required where:

1. The alteration involves the addition of only one story;
2. Existing standpipes in existing stair shafts are extended in accordance with this chapter;
3. Standpipe hose connections are provided in compliance with Section 905.4, Item 6; and
4. The demand on the standpipe system, including any additional demand, with respect to flow and pressure does not exceed the capacity of the existing approved system.

**901.9.5.4 Additional requirements for enlargements of buildings with no existing standpipe systems.** Where the alteration involves the addition of stories to a building with no existing standpipe system, standpipes shall be provided to all stair shafts in accordance with this chapter.

**Exception:** Standpipes are not required where:

1. the alteration involves the addition of only one story;
2. the completed building does not exceed 7 stories; and
3. the completed building does not exceed 85 feet (25.9 m) in height.

**901.9.6 Seismic supports.** The determination as to whether seismic requirements apply to an alteration shall be made in accordance with the 1968 *Building Code* and interpretations by the department relating to such determinations. Any applicable seismic loads and requirements shall be permitted to be determined in accordance with Chapter 16 of this code or the 1968 *Building Code* and Reference Standard RS 9-6 of such code.

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devices and transponder(s) or off-premises transmitter(s). The control unit may be capable of providing a transfer of power to the notification appliances and transfer of condition to relays or devices.

**FIRE ALARM SIGNAL.** A signal initiated by a fire alarm-initiating device such as a manual fire alarm box, automatic fire detector, water flow switch, or other device whose activation is indicative of the presence of a fire or fire signature.

**FIRE ALARM SYSTEM.** A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to those signals.

**FIRE AREA.** The aggregate floor area enclosed and bounded by fire walls, fire barriers, exterior walls and/or horizontal assemblies of a building. Areas of the building not provided with surrounding walls shall be included in the fire area if such areas are included within the horizontal projection of the roof or floor next above.

**FIRE COMMAND CENTER.** The principal attended or unattended location where the status of detection, alarm communications and control systems is displayed, and from which the system(s) can be manually controlled.

**FIRE DETECTOR, AUTOMATIC.** A device designed to detect the presence of a fire signature and to initiate action.

**FIRE PROTECTION SYSTEM.** Approved devices, equipment and systems or combinations of systems used to detect a fire, activate an alarm, extinguish or control a fire, control or manage smoke and products of a fire or any combination thereof.

**FIRE PUMP.** A pump used exclusively for fire protection. A pump used only to fill a tank is not a fire pump.

**Fire pump, automatic standpipe.** A fire pump located at or below street level that supplies the lower 300 feet (91.4 m) of a standpipe system or a combined standpipe and sprinkler system.

**Fire pump, foam.** A fire pump used to boost water supply pressures in a fire protection system where such system uses firefighting foam as an additive.

**Fire pump, limited service.** A fire pump with a motor rating not exceeding 30 hp and utilizing a limited service fire pump controller.

**Fire pump, special service.** A fire pump that is located above street level and that receives its water supply from a gravity tank or suction tank.

**Fire pump, sprinkler booster pump.** A fire pump that supplies sprinkler systems only.

**Fire pump, water mist system.** A fire pump used to boost water supply pressures in a fire protection system where such system utilizes water misting technology.

**FIRE SAFETY FUNCTIONS.** Building and fire control functions that are intended to increase the level of life safety for occupants or to control the spread of harmful effects of fire.

**FOAM-EXTINGUISHING SYSTEM.** A special system discharging foam made from concentrates, either mechanically or chemically, over the area to be protected.

**HALOGENATED EXTINGUISHING SYSTEM.** A fire-extinguishing system using one or more atoms of an element from the halogen chemical series: fluorine, chlorine, bromine and iodine.

**INITIATING DEVICE.** A system component that originates transmission of a change-of-state condition, such as in a smoke detector, manual fire alarm box or supervisory switch.

**LIMITED AREA SPRINKLER SYSTEM.** An automatic sprinkler system serving fewer than 20 sprinkler heads on any single connection.

**LISTED.** See Chapter 1 of Title 28 of the *Administrative Code*.

**MANUAL FIRE ALARM BOX.** A manually operated device used to initiate an alarm signal.

**MULTIPLE-STATION ALARM DEVICE.** Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes all integral or separate audible alarms to operate. It also can consist of one single-station alarm device having connections to other detectors or to a manual fire alarm box.

**MULTIPLE-STATION SMOKE ALARM.** Two or more single-station alarm devices that are capable of interconnection such that actuation of one causes the appropriate alarm signal to operate in all interconnected alarms.

**POST-FIRE SMOKE PURGE SYSTEM.** A mechanical or natural ventilation system intended to move smoke from the smoke zone to the exterior of the building. Such systems are intended for the timely restoration of operations and overhaul activities once a fire is extinguished. Post-fire smoke purge systems are not intended or designed to be life safety systems.

**PRESIGNAL SYSTEM.** A fire alarm system having a feature that allows initial fire alarm signals to sound in a constantly attended central location and for which a human action is subsequently required to achieve a general alarm, or a feature that allows the control equipment to delay the general alarm by more than 1 minute after the start of the alarm processing.

**RECORD DRAWINGS.** Drawings ("as built") that document the location of all devices, appliances, wiring sequences, wiring methods and connections of the components of a fire alarm system as installed.

**SINGLE-STATION SMOKE ALARM.** An assembly incorporating the detector, the control equipment and the alarm-sounding device in one unit, operated from a power supply either in the unit or obtained at the point of installation.

**SMOKE ALARM.** A single- or multiple-station alarm responsive to smoke.

**SMOKE DETECTOR.** A listed device that senses visible or invisible particles of combustion.



**Supervising station, central.** A supervising station that is listed and approved by the Fire Department for central station service.

**Supervising station, proprietary.** A supervising station under the same ownership as the protected premises' fire alarm system(s) that it supervises (monitors) and to which alarm, supervisory, or trouble signals are received and where personnel are in attendance at all times to supervise operation and investigate signals.

**Supervising station, remote.** A supervising station to which alarm, supervisory, or trouble signals or any combination of those signals emanating from protected premises' fire alarm systems are received and where personnel are in attendance at all times to respond.

**SUPERVISORY SERVICE.** The service required to monitor performance of guard tours and the operative condition of fixed suppression systems or other systems for the protection of life and property.

**SUPERVISORY SIGNAL.** A signal indicating the need for action in connection with the supervision of guard tours, fire suppression systems or equipment, fire alarm systems, or the maintenance features of related systems.

**SUPERVISORY SIGNAL-INITIATING DEVICE.** An initiation device, such as a valve supervisory switch, water-level indicator or low-air pressure switch on a dry-pipe sprinkler system, whose change of state signals an off-normal condition and its restoration to normal of a fire protection or life safety system, or a need for action in connection with the supervision of guard tours, fire suppression systems or equipment, fire alarm systems, or the maintenance features of related systems.

**TIRES, BULK STORAGE OF.** Storage of tires where the area available for storage exceeds 20,000 cubic feet (566 m<sup>3</sup>).

**TROUBLE SIGNAL.** A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component.

**VALUE (OF ALTERATIONS TO DETERMINE REQUIRED FIRE PROTECTION).** The value of alterations shall be determined by adding the estimated cost of the proposed alteration, excluding minor alterations and ordinary repairs, computed as of the time of submitting the application for construction document approval, to the actual cost of any and all alterations made in the preceding 12-month period. Where the proposed alteration includes an enlargement, the value of such alteration shall include the cost of the enlargement.

**VALUE (OF EXISTING BUILDING OR SPACE).** See Section 202.

**VISIBLE ALARM NOTIFICATION APPLIANCE.** A notification appliance that alerts by the sense of sight.

**WET-CHEMICAL EXTINGUISHING SYSTEM.** A solution of water and potassium-carbonate-based chemical.

2014 NEW YORK CITY BUILDING CODE



potassium-acetate-based chemical or a combination thereof, forming an extinguishing agent.

**WIRELESS PROTECTION SYSTEM.** A system or a part of a system that can transmit and receive signals without the aid of wire.

**ZONE.** A defined area within the protected premises. A zone can define an area from which a signal can be received, an area to which a signal can be sent or an area in which a form of control can be executed.

**ZONE, NOTIFICATION.** An area within a building or facility covered by notification appliances which are activated simultaneously.

## SECTION BC 903 AUTOMATIC SPRINKLER SYSTEMS

**903.1 General.** Automatic sprinkler systems shall comply with this section. Installation of automatic sprinkler systems shall comply with the special inspection requirements of Chapter 17.

**903.1.1 Alternative protection.** Where the discharge of water would be hazardous, alternative automatic fire-extinguishing systems complying with Section 904 shall be permitted in lieu of automatic sprinkler protection where recognized by the applicable standard and approved by the commissioner.

**903.1.2 Construction documents.** Construction documents for automatic sprinkler systems shall contain plans that include the following data and information:

1. The location and size of water supplies and the location, spacing, number, and type of sprinkler heads to be used, with approximate location and size of all feed mains, valves and other essential features of the system. For hydraulically calculated systems, hydraulic data substantiating pipe sizes shown shall be submitted and hydraulic reference points and areas must be indicated on the plan.
2. A diagram showing the proposed sprinkler system in relation to principal construction features of the building, such as its size, walls, columns, and partitions; and such other information as may be necessary for the evaluation of the system.
3. The location, number, and type of any electrical or automatic devices or alarms to be used in the system.
4. In buildings where a new separate fire sprinkler system is required, the available water pressure at the top and bottom floors of each zone shall be shown on the riser diagram.
5. For street pressure-fed systems and fire pumps, a statement from the New York City Department of Environmental Protection, giving the minimum water pressure in the main serving the building.

**903.2 Where required.** Approved automatic sprinkler systems in new buildings and structures shall be provided in the locations described in this section.

### Exceptions:

1. Sprinklers shall not be required in electrical equipment rooms where all of the following conditions are met:
  - 1.1. The room is dedicated to electrical equipment only.
  - 1.2. Only dry-type electrical equipment is used.
  - 1.3. Equipment is installed in a 2-hour fire-rated enclosure including protection for penetrations.
  - 1.4. No combustible storage is permitted to be stored in the room.
2. Sprinklers shall not be permitted in elevator machine rooms and elevator machinery spaces.

**903.2.1 Group A.** An automatic sprinkler system shall be provided throughout buildings and portions thereof used as Group A occupancies as provided in this section. For Group A-1, A-2, A-3 and A-4 occupancies, the automatic sprinkler system shall be provided throughout the floor area where the Group A-1, A-2, A-3 or A-4 occupancy is located, and in all floors between the Group A occupancy and the level of exit discharge. For Group A-5 occupancies, the automatic sprinkler system shall be provided in the spaces indicated in Section 903.2.1.5. In all Group A occupancies providing live entertainment, dressing rooms and property rooms used in conjunction with such assembly occupancy shall be provided with an automatic sprinkler system. Stages shall comply with Section 410.6.

**903.2.1.1 Group A-1.** An automatic sprinkler system shall be provided for Group A-1 occupancies where any one of the following conditions exists:

1. The fire area exceeds 12,000 square feet (1115 m<sup>2</sup>).
2. The fire area has an occupant load of 300 or more.
3. The aggregate occupant load of all fire areas occupied by Group A, located on any given floor other than the level of exit discharge, is 300 or more.
4. The fire area contains a multitheater complex.

**903.2.1.2 Group A-2.** An automatic sprinkler system shall be provided for Group A-2 occupancies where any one of the following conditions exists:

1. The fire area exceeds 5,000 square feet (464.5 m<sup>2</sup>).
2. The fire area has an occupant load of 300 or more.
3. The aggregate occupant load of all fire areas occupied by Group A, located on any given floor other than the level of exit discharge, is 300 or more.
4. The A-2 occupancy is used as a cabaret.

**903.2.1.3 Group A-3.** An automatic sprinkler system shall be provided for Group A-3 occupancies where any one of the following conditions exists:

1. The fire area exceeds 12,000 square feet (1115 m<sup>2</sup>).
2. The fire area has an occupant load of 300 or more.
3. The aggregate occupant load of all fire areas occupied by Group A, located on any given floor other than the level of exit discharge, is 300 or more.

**Exception:** Areas used exclusively as participant sports areas where the main floor area is located at the same level as the level of exit discharge of the main entrance and exit.

**903.2.1.4 Group A-4.** An automatic sprinkler system shall be provided for Group A-4 occupancies where any one of the following conditions exists:

1. The fire area exceeds 12,000 square feet (1115 m<sup>2</sup>).
2. The fire area has an occupant load of 300 or more.
3. The aggregate occupant load of all fire areas occupied by Group A, located on any given floor other than the level of exit discharge, is 300 or more.

**Exception:** Areas used exclusively as participant sports areas where the main floor area is located at the same level as the level of exit discharge of the main entrance and exit.

**903.2.1.5 Group A-5.** An automatic sprinkler system shall be provided in all enclosed areas of the structure, including but not limited to the concession concourse, concession stands, retail areas, press boxes and other accessory occupancies, in excess of 1,000 square feet (93 m<sup>2</sup>).

**903.2.2 Group B ambulatory health care facilities.** An automatic sprinkler system shall be installed throughout all fire areas containing a Group B ambulatory health care facility occupancy when either of the following conditions exists at any time:

1. Four or more care recipients are incapable of self-preservation.
2. One or more care recipients who are incapable of self-preservation are located at other than the level of exit discharge serving such an occupancy.

**903.2.3 Group E.** An automatic sprinkler system shall be provided for Group E occupancies as follows:

1. Throughout all Group E fire areas greater than 20,000 square feet (1858 m<sup>2</sup>) in area.
2. Throughout every portion of educational buildings below the level of exit discharge.

**Exception:** An automatic sprinkler system is not required in any fire area or area below the level of

exit discharge where every classroom throughout the building has at least one exterior exit door at ground level without intervening corridors, passageways, or exit enclosures.

**903.2.4 Group F.** An automatic sprinkler system shall be provided throughout all buildings containing a Group F occupancy where any one of the following conditions exists:

1. Where a Group F-1 fire area exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. Where a Group F-1 fire area is located more than three stories above grade; or
3. Where the combined area of all Group F-1 fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m<sup>2</sup>); or
4. Where required by Section 280 of the *New York State Labor Law* for "factory buildings" defined in Section 2 of such law.

**903.2.4.1 Woodworking operations.** An automatic sprinkler system shall be provided throughout any Group F-1 occupancy fire area that contains wood working operations in excess of 2,500 square feet (232 m<sup>2</sup>) in area that generate finely divided combustible waste or use finely divided combustible materials.

**903.2.4.2 Repair garages.** An automatic sprinkler system shall be provided throughout all buildings used as repair garages in accordance with Section 406, as follows:

1. Buildings two or more stories in height, including basements, with a fire area containing a repair garage exceeding 10,000 square feet (929 m<sup>2</sup>).
2. One-story buildings with a fire area containing a repair garage exceeding 12,000 square feet (1115 m<sup>2</sup>).
3. A Group F-1 fire area used for the repair of commercial trucks or buses where the fire area exceeds 5,000 square feet (464 m<sup>2</sup>).
4. Buildings with a repair garage servicing vehicles parked in the basement.

**903.2.4.3 Group F-1 fire areas.** An automatic sprinkler system shall be provided throughout any Group F-1 occupancy fire area where any one of the following conditions exists:

1. The fire area exceeds 7,500 square feet (697 m<sup>2</sup>).
2. The fire area of any size is located more than three stories above grade.

**903.2.5 Group H.** Automatic sprinkler systems shall be provided in high-hazard occupancies as required in Sections 903.2.5.1 through 903.2.5.3 and the *New York City Fire Code*.

**903.2.5.1 General.** An automatic sprinkler system shall be installed in Group H occupancies. An automatic sprinkler system shall be installed throughout buildings with a main use or dominant occupancy of Group H.

**903.2.5.2 Group H-5.** An automatic sprinkler system shall be installed throughout buildings containing Group H-5 occupancies. The design of the sprinkler system shall not be less than that required by this code for the occupancy hazard classifications in accordance with Table 903.2.5.2. Where the design area of the sprinkler system consists of a corridor protected by one row of sprinklers, the maximum number of sprinklers required to be calculated is 13.

**TABLE 903.2.5.2  
GROUP H-5 SPRINKLER DESIGN CRITERIA**

LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Corridors	Ordinary Hazard Group 2

**903.2.5.3 Pyroxylin plastics.** An automatic sprinkler system shall be provided in buildings, or portions thereof, where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds (45 kg).

**903.2.6 Group I.** An automatic sprinkler system shall be provided in Group I occupancies. An automatic sprinkler system shall be installed throughout buildings with a main use or dominant occupancy of Group I.

**Exception:** An automatic sprinkler system installed in accordance with Section 903.3.1.2 or 903.3.1.3 shall be allowed in Group I-1 facilities.

**903.2.7 Group M.** An automatic sprinkler system shall be provided throughout buildings containing a Group M occupancy where any one of the following conditions exists:

1. Where a Group M fire area exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. Where a Group M fire area is located more than three stories above grade plane.
3. Where the combined area of all Group M fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m<sup>2</sup>).

**903.2.7.1 High-piled storage.** An automatic sprinkler system shall be provided in accordance with the *New York City Fire Code* in all buildings of Group M where storage of merchandise is in high-piled or rack storage arrays.

**903.2.7.2 Group M fire areas.** An automatic sprinkler system shall be provided throughout any Group M occupancy fire area where any one of the following conditions exists:

1. The fire area exceeds 7,500 square feet (697 m<sup>2</sup>).
2. The fire area of any size contains an unenclosed stair or escalator connecting two or more floors.

**903.2.8 Group R.** An automatic sprinkler system shall be installed in Group R fire areas. An automatic sprinkler system shall be installed throughout buildings with a main use or dominant occupancy of Group R.

**Exception:** An automatic sprinkler system shall not be required in detached one- and two-family dwellings and multiple single-family dwellings (townhouses), provided that such structures are not more than three stories above grade plane in height and have separate means of egress.

**903.2.9 Group S-1.** An automatic sprinkler system shall be provided throughout all buildings containing a Group S-1 occupancy where any one of the following conditions exists:

1. A Group S-1 fire area exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. The building is greater than 1,000 square feet (92.9 m<sup>2</sup>) in area and the main use or dominant occupancy is Group S-1; or
3. A Group S-1 fire area is located more than three stories above grade plane.
4. The combined area of all Group S-1 fire areas on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m<sup>2</sup>).

**903.2.9.1 Group S-1 fire areas.** An automatic sprinkler system shall be provided throughout any Group S-1 occupancy fire area where the fire area exceeds 500 square feet (16 m<sup>2</sup>).

**903.2.9.2 Bulk storage of tires.** Buildings and structures where the area for the storage of tires exceeds 500 square feet (47 m<sup>2</sup>) or 7,500 cubic feet (212 m<sup>3</sup>) shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

**903.2.10 Group S-2.** An automatic sprinkler system shall be installed throughout buildings greater than 5,000 square feet (465 m<sup>2</sup>) in area where the main use or dominant occupancy is Group S-2.

**903.2.10.1 Commercial parking garages.** An automatic sprinkler system shall be provided throughout buildings used for storage of commercial trucks or buses where the fire area exceeds 5,000 square feet (465 m<sup>2</sup>).

**903.2.10.2 Group S-2 fire areas.** An automatic sprinkler system shall be provided throughout any Group S-2 occupancy fire area greater than 5,000 square feet (465 m<sup>2</sup>).

**903.2.10.3 Parking garages.** An automatic sprinkler system shall be provided throughout buildings classified as enclosed parking garages in accordance with Section 406.4 or where an open or enclosed parking garage is located beneath other occupancy groups.

**Exception:** Parking garages located beneath Group R-3 occupancies.

**903.2.11 Specific building areas and hazards.** An automatic sprinkler system shall be installed for building



fronts on a street or frontage space required pursuant to Section 501.3.1.

Such windows shall be openable from the inside or breakable from both the inside and the outside, and shall have a size when open of at least 24 inches by 36 inches (610 mm by 914 mm). Such panels shall be openable from both the inside and outside and shall have a height when open of 48 inches (1219 mm) and a width of at least 32 inches (813 mm). The sill of the window or panel shall not be higher than 36 inches (914 mm) above the inside floor. Where not all of the windows are openable or breakable, the windows intended to satisfy the requirements of this section shall be readily identifiable.

- 903.2.11.3 Other below-grade stories.** An automatic sprinkler system shall be installed throughout every first basement or cellar story below grade of buildings on which access is not provided directly from the outdoors within each 100 feet (30 480 mm) or fraction thereof of horizontal length of every wall that fronts on a street or frontage space required pursuant to Section 501.3.1.

1. One- and two-family dwellings need not provide direct access.
2. Any building classified in Occupancy Group R-2 not more than three stories in height and with not more than two dwelling units on any story need not provide direct access when such first basement or cellar story is used for dwelling units or for uses accessory to the residential use in the building.
3. Except as provided in Exception 2, above, for Group R-1 and R-2 occupancies, only one direct access from the outdoors to the first basement or cellar story consisting of a stair or door shall be required when such story is used for dwelling units or for uses accessory to the residential use in the building.

Such access shall be by stairs, doors, windows or other means that provide an opening 48 inches (1219 mm) high and 32 inches (813 mm) wide, the sill of which shall not be higher than 36 inches (914 mm) above the inside floor. If an areaway is used to provide below grade access, the minimum horizontal dimension shall be at least one-third the depth of the areaway or 6 feet (1829 mm), whichever is less.

**903.2.11.4 Signs obstructing openings.** Where wall signs are erected to cover doors or windows of existing buildings, access panels shall be provided as necessary to comply with the requirements of Section 903.2.11.

**903.2.11.5 Compliance with the New York State Multiple Dwelling Law.** Nothing in Section 903.2.11 shall be construed so as to supersede any applicable provisions of Section 54 of the *New York State Multiple*

**903.2.11.2 Other above-grade stories.** An automatic sprinkler system shall be installed throughout every above-grade story of buildings below a height of 100 feet (30 480 mm), other than the first story or ground floor, on which access is not provided directly from the outdoors by at least one window or readily identifiable access panel within each 50 feet (15 240 mm) or fraction thereof of horizontal length of every wall that



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NYC Dwelling Law relating to access to cellars or basements in multiple dwellings.

NYC **903.2.11.6 Rubbish and linen chutes.** An automatic sprinkler system shall be installed at the top of rubbish and linen chutes, in chute access rooms, and in their terminal rooms. Chutes extending through three or more floors shall have additional sprinkler heads installed within such chutes at alternate floors. Chute sprinklers shall be accessible for servicing.

NYC **903.2.11.7 Buildings over 55 feet in height.** An automatic sprinkler system shall be installed throughout buildings with a floor level having an occupant load of 30 or more that is located 55 feet (16 764 mm) or more above the lowest level of Fire Department vehicle access.



NYC **903.2.11.8 Ducts conveying hazardous exhausts.** Where required by the *New York City Mechanical Code*, automatic sprinklers shall be provided in ducts conveying hazardous exhaust, or flammable or combustible materials.

**Exception:** Ducts in which the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).

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NYC **903.2.11.9 Commercial cooking operations.** An automatic sprinkler system shall not be installed in a commercial kitchen exhaust hood and duct system. Fire-extinguishing systems shall be installed in commercial cooking systems in accordance with Section 904.11.

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NYC **903.2.11.10 Other buildings, occupancies and areas.** In addition to the requirements of Section 903.2, the provisions indicated in Table 903.2.11.10 also require the installation of a suppression system for certain buildings and areas. Suppression systems shall also be required as provided for in other sections of this code, the *New York City Fuel Gas Code*, and the *New York City Mechanical Code*.

**TABLE 903.2.11.10  
ADDITIONAL REQUIRED SUPPRESSION SYSTEMS**

OCCUPANCY GROUP, SPECIFIED USE, MATERIALS OR EQUIPMENT (in alphabetical order)	CODE SECTION
Aerosol warehouses	FC 2804.4.1
Atriums	BC 404.3
Automated storage; buildings with	FC 2309.2
Chutes; refuse and laundry	BC 708.13
Chute vestibules	BC Appendix Q 21.16.2.1.1
Cold storage buildings: ice plants, food plants and food processing rooms with foam insulation up to 10 inches in thickness	BC 2603.3
Combustible fibers; storage at waterfront structures	FC 2906.6
Combustible fibers, loose; storage of more than 1,000 sq ft of	FC 2904.5
Commercial cooking systems	BC 904.11 FC 904.11
Commercial cooking systems with solid fuel storage	FC 904.11.7
Commercial cooking system with Type I hood	BC 904.2.1 MC 509.1
Covered mall and open mall buildings	BC 402.9

(continued)

**TABLE 903.2.11.10—continued  
ADDITIONAL REQUIRED SUPPRESSION SYSTEMS**

OCCUPANCY GROUP, SPECIFIED USE, MATERIALS OR EQUIPMENT (in alphabetical order)	CODE SECTION
Dead end public streets; buildings on	FC 503.8.1
Dip tank rooms	FC 1505.1
Dip tanks	FC 1505.6.1
Dry cleaning machines	FC 1208.3
Dry cleaning plants	FC 1208.2
Drying rooms	BC 417.4
Elevator lobbies	BC 708.14.1
Exhausted enclosures	FC 2703.8.5.3
Extra-high-rack combustible storage; buildings with	FC 2308.5.1
Flammable and combustible liquid in Group H-2 or H-3 areas	FC 3405.3.7.3
Flammable and combustible liquid storage rooms	FC 3404.3.7.5.1
Flammable and combustible liquid storage warehouses	FC 3404.3.8.4
Flammable finishes	BC 416.5
Fuel-oil tanks and fuel-oil burning equipment; rooms containing	MC 1305.13.3
Furnaces: Class A and B	FC 2106.1
Furnaces: Class C and D	FC 2106.2
Gas rooms	FC 2703.8.4
Glazing in smoke partition	BC 711.2
Group H-2	BC 415.6.2.4
Group H-5, including but not limited to: workstations, gas cabinet, exhausted enclosures, pass-throughs in exit access corridors and exhaust ducts	BC 415.8
Group I-2	BC 407.5
Hardening and tempering tanks	FC 1505.8.4
Hazardous exhaust system ducts	MC 510.7
Hazardous materials; indoor handling or use of	FC 2705.1.8
Hazardous materials; indoor storage of	FC 2704.5
Hazardous Production Material ("HPM") corridors	FC 1803.10.3
Hazardous Production Material ("HPM") exhaust ducts	FC 1803.10.4
Hazardous Production Material ("HPM") facilities	FC 1803.10
Hazardous Production Material ("HPM") gas cabinets	FC 1803.10.2
Hazardous Production Material ("HPM") work station exhaust	FC 1803.10.1.1
High Pressure Gas Installations; buildings with	FGC G.2.3
Highly toxic and toxic compressed gases; exhausted enclosures for	FC 3704.1.3
Highly toxic and toxic compressed gases; gas cabinets containing	FC 3704.1.2
Highly toxic and toxic compressed gases; gas rooms utilizing	FC 3704.2.2.6
Highly toxic and toxic compressed gases; outdoor storage of	FC 3704.3.3
High-rise buildings	BC 403.3
Incidental uses	BC 509.4.2
Equipment platforms	BC 505.5.2
Kiosks in covered mall buildings	BC 402.11
Kiosks, displays, booths, or concession stands; covered	FC 314.5.1
Laboratory units; non-production	BC 424.6.1
Liquefied petroleum gas ("LPG") within buildings accessible to the public; storage of	FC 3809.9
Liquids, Class II and III, below grade storage of	FC 3404.3.5.1
Liquids, Class II and III, below grade storage of, accessory to retail	BC 414.2.5.1
Medical gas; storage of	FC 3006.2.1
Organic coatings; manufacturing of	BC 418.1
Oxidizer, solid and liquid; storage areas	FC 4004.1.4

(continued)

**TABLE 903.2.11.10 —continued**  
**ADDITIONAL REQUIRED SUPPRESSION SYSTEMS**

	OCCUPANCY GROUP, SPECIFIED USE, MATERIALS OR EQUIPMENT (in alphabetical order)	CODE SECTION
NYC	Plastic light diffusing system	BC 2606.7.4
NYC	Pyroxylin plastic; areas with	FC 4204.1.1
NYC	Pyroxylin plastic; storage and manufacturing	FC 4204.2
NYC	Pyroxylin plastic; storage vaults	FC 4204.1.3
NYC	Rack storage	FC 2308.2
NYC	Radioactive materials and radiation-producing equipment; uses and occupancies involving	BC 425.3.4
NYC	Resin application areas	FC 1511.3
NYC	Silane gas; exhausted enclosures or gas cabinets for	FC 4106.2.2
NYC	Small arms ammunition and primers, black powder or smokeless propellant; storage of	FC 3306.7
NYC	Solid-piled and shelf storage	FC 2307.2
	Smoke-protected assembly seating	BC 1028.6.2.3
	Special amusement buildings	BC 411.4
NYC	Spray booths and rooms	FC 1504.6
NYC	Spray booths involving the use of organic peroxide coatings	FC 1509.6
NYC	Spray finishing in Group A, E, I or R	FC 1504.1
NYC	Stages	BC 410.6
NYC	Sterilization systems; rooms with	FC 3506.3.2
NYC	Storage	FC Table 2306.2 FC 2306.4
NYC	Substandard width public streets; buildings on	FC 503.8.2
NYC	Textile ceiling finish	BC 803
NYC	Textile wall coverings	BC 803
NYC	Underground buildings and spaces	BC 405.3
NYC	Unlimited area buildings	BC 507

**903.2.11.11 Steel-plated and vault-like occupancies.**

An automatic sprinkler system shall be installed throughout all steel-plated or similarly reinforced or secured vault-like occupancies regardless of area.

**903.2.11.12 Refuse collection and disposal areas.** An automatic sprinkler system shall be installed throughout all areas used for the storage and sorting of refuse and recyclables.

**903.2.11.13 Laundry drying areas.** An automatic sprinkler system shall be installed in spaces in which two or more clothes drying machines are installed. Sprinkler heads shall be spaced to cover the areas 5 feet (1524 mm) on all sides of the drying machines.

**903.2.12 During construction.** Automatic sprinkler systems required during construction, alteration and demolition operations shall be provided in accordance with Chapter 33 and the *New York City Fire Code*.

**903.3 Installation requirements.** Automatic sprinkler systems shall be designed and installed in accordance with Sections 903.3.1 through 903.3.6.

**903.3.1 Standards.** Sprinkler systems shall be designed and installed in accordance with Section 903.3.1.1, 903.3.1.2 or 903.3.1.3.

**903.3.1.1 NFPA 13 sprinkler systems.** Where the provisions of this code require that a building or portion thereof be equipped throughout with an automatic

sprinkler system in accordance with this section, sprinklers shall be installed throughout in accordance with NFPA 13 as modified in Appendix Q except as provided in Section 903.3.1.1.1 and 903.2.

**903.3.1.1.1 Exempt locations protected by other**

**means.** Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an approved automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion and an alternative extinguishing system in accordance with Section 904. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance-rated construction or contains electrical equipment.

1. Any room where the application of water, or flame and water, constitutes a serious life or fire hazard.

2. Any room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the commissioner.

3. Generator and transformer rooms separated from the remainder of the building by walls and floor/ceiling or roof/ceiling assemblies having a fire-resistance rating of not less than 2 hours where the generator is not using high pressure flammable gas in excess of 15 psi (103.4 kPa).

**903.3.1.2 NFPA 13R sprinkler systems.** Where allowed in buildings of Group R, up to and including six stories in height, automatic sprinkler systems shall be installed throughout in accordance with NFPA 13R as modified in Appendix Q.

**903.3.1.2.1 Balconies and decks.** Sprinkler protection shall be provided for exterior balconies, decks and ground-floor patios of dwelling units where the building is of Type V construction and automatic sprinkler protection is required for the Group R occupancy. Side wall sprinklers that are used to protect such areas shall be permitted to be located such that their deflectors are within 1 inch (25 mm) to 6 inches (152 mm) below the structural members, and a maximum distance of 14 inches (356 mm) below the deck of the exterior balconies and decks that are constructed of open wood joist construction.

**903.3.1.3 NFPA 13D sprinkler systems.** Where allowed, automatic sprinkler systems in one- and two-family dwellings and townhouses shall be installed throughout in accordance with NFPA 13D as modified.

**903.3.2 Quick-response and residential sprinklers.** Where automatic sprinkler systems are required by this code, quick-response or residential automatic sprinklers

shall be installed in the following areas in accordance with Section 903.3.1 and their listings:

- NYC 1. Throughout all spaces within a smoke compartment containing patient dwelling units in Group I-2 in accordance with this code.
- NYC 2. Dwelling units in Group R and I-1 occupancies.
3. Light-hazard occupancies as defined in NFPA 13.

**903.3.3 Obstructed locations.** Automatic sprinklers shall be installed with due regard to obstructions that will delay activation or obstruct the water distribution pattern. Automatic sprinklers shall be installed in or under covered kiosks, displays, booths, concession stands, or equipment that exceeds 4 feet (1219 mm) in width. Not less than a 3-foot (914 mm) clearance shall be maintained between automatic sprinklers and the top of piles of combustible fibers.

**Exception:** Kitchen equipment under exhaust hoods protected with a fire-extinguishing system in accordance with Section 904.

NYC **903.3.4 Actuation.** Automatic sprinkler systems shall be automatically actuated unless otherwise specifically provided in this code.

NYC **903.3.5 Water supplies.** Water supplies for automatic sprinkler systems shall comply with this section and the standards referenced in Section 903.3.1. The potable water supply shall be protected against back flow in accordance with the requirements of this section, the *New York City Plumbing Code*, and Rules of the New York City Department of Environmental Protection.

NYC **903.3.5.1 Domestic services.** Where the domestic service provides the water supply for the automatic sprinkler system, the supply shall be in accordance with NFPA 13.

NYC **903.3.5.1.1 Limited area sprinkler systems.** Limited area sprinkler systems serving fewer than 20 sprinklers on any single connection are permitted to be connected to the domestic service where a wet automatic standpipe is not available. Limited area sprinkler systems connected to domestic water supplies shall comply with NFPA 13.

The domestic service shall be capable of supplying the simultaneous domestic demand and the sprinkler demand required to be hydraulically calculated by NFPA 13, NFPA 13R or NFPA 13D.

NYC **903.3.5.1.2 Residential combination services.** A single combination water supply shall be permitted in accordance with NFPA 13R.

NYC **903.3.5.2 Secondary water supply.** A secondary on-site water supply equal to the hydraulically calculated sprinkler demand, including the hose stream requirement, shall be provided for high-rise buildings in Seismic Design Category C or D as determined by this code, and in any high-rise building with occupied floors located more than 300 feet (91 440 mm) above the lowest level of Fire Department vehicle access. The secondary water supply shall have a duration not less

than 30 minutes as determined by the occupancy hazard classification in accordance with NFPA 13.

**903.3.6 Hose threads.** Fire hose threads and fittings used in connection with automatic sprinkler systems shall be approved and compatible with Fire Department hose threads.

**903.3.7 Fire Department connections.** The location of Fire Department connections shall be installed in accordance with Sections 905 and 912.

**903.4 Sprinkler system supervision and alarms.** All valves controlling the water supply for automatic sprinkler systems, pumps, tanks, water levels and temperatures, critical air pressures and water-flow switches on all sprinkler systems shall be electrically supervised by the fire alarm system where a fire alarm system is required by Section 907.

#### Exceptions:

- Automatic sprinkler systems protecting one- and two-family dwellings.
- Automatic sprinkler systems installed in accordance with NFPA 13R where a common supply main is used to supply both domestic water and the automatic sprinkler systems and a separate shutoff valve for the automatic sprinkler system is not provided.
- Jockey pump control valves that are sealed or locked in the open position.
- Control valves to commercial kitchen hoods, paint spray booths or dip tanks that are sealed or locked in the open position.
- Valves controlling the fuel supply to fire pump engines that are sealed or locked in the open position.
- Trim valves to pressure switches in dry, preaction and deluge sprinkler systems that are sealed or locked in the open position.

**903.4.1 Signals and monitoring.** Alarm, supervisory and trouble signals shall be distinctly different and shall be automatically transmitted to a central supervising station or when approved by the Fire Department, shall sound an audible signal at a constantly attended location.

#### Exceptions:

- Underground key or hub valves in roadway boxes provided by the city or a public utility are not required to be monitored.
- Back flow prevention device test valves, located in limited area sprinkler system supply piping, shall be locked in the open position. In occupancies required to be equipped with a fire alarm system, the back flow preventer valves shall be electrically supervised by a tamper switch installed in accordance with NFPA 72 and separately annunciated.

**903.4.2 Alarms.** Approved audible devices shall be connected to every automatic sprinkler system. Such sprinkler water-flow alarm devices shall be activated by water flow equivalent to the flow of a single sprinkler of the



smallest orifice size installed in the system. Alarm devices shall be provided on the exterior of the building in an approved location or in a location approved by the Fire Department, except in buildings equipped with a fire alarm system. Where a fire alarm system is installed, actuation of the automatic sprinkler system shall actuate the building fire alarm system.

**903.4.3 Floor control valves.** Approved supervised indicating control valves shall be provided at the point of connection to the riser on each floor in high-rise buildings.

**903.5 Testing and maintenance.** Sprinkler systems shall be tested and maintained in accordance with the *New York City Fire Code*.

**903.6 Painting of dedicated sprinkler piping and valve handles.** Dedicated sprinkler piping shall be painted and such painting certified in accordance with Sections 903.6.1 through 903.6.5. In addition to painting, sprinkler piping may also be identified by lettered legend in accordance with ANSI A13.1. Where the piping is required to be listed and labeled such painting shall not obscure such labeling.

**Exceptions:**

1. Attachments, gauges, valves and operable parts of sprinkler systems other than valve handles.
2. Horizontal branch lines.
3. Where different color coding may be required by Section 3406 of the *New York City Fire Code* for facilities storing, handling, and using flammable and combustible liquids in connection with special operations.

**903.6.1 New buildings.** Cross connections and risers in new buildings, including buildings constructed pursuant to Section 28-101.4.2 of the *Administrative Code*, shall be painted red and the handles of valves serving dedicated sprinklers shall be painted green prior to the hydrostatic pressure test regardless of whether they will be enclosed at a later point in time.

**Exception:** Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

**903.6.2 Alterations.** Cross connections and risers for independent (stand-alone) existing sprinkler systems that are exposed during alterations, including alterations pursuant to Section 28-101.4.2 of the *Administrative Code*, shall be painted red and the handles of valves serving such existing sprinkler systems shall be painted green. Where the alteration requires a hydrostatic pressure test such painting shall be completed prior to such test.

**Exception:** Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

**903.6.3 Retroactive requirement for completed buildings.** Notwithstanding any other provision of law, all exposed risers and cross connections of completed buildings in existence on March 2, 2010 shall be painted red by June 2, 2010, and all handles of valves serving such sprinkler system shall be painted green.

**Exception:** Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.

**903.6.4 Buildings under construction on March 2, 2010.** Notwithstanding any other provision of law, where construction documents were approved and permits issued for the construction of a new building or alteration of an existing building prior to March 2, 2010 and the work is not signed off by the department prior to such date, all exposed cross connections and risers in any such building shall be painted red prior to the hydrostatic pressure test, including cross connections and risers that will be enclosed at a later point in time, and handles of valves serving such sprinkler system shall be painted green.

**Exceptions:**

1. Where a standpipe system is used as a combination standpipe and sprinkler system, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red and the handles of valves serving such combination system shall be painted yellow.
2. Cross connections and risers enclosed prior to March 2, 2010 need not be painted.

**903.6.5 Certification of completion of system painting.** For all buildings where sprinkler and combination sprinkler and standpipe systems are not subject to a special inspection pursuant to Section 1704.23 of this code, a licensed master plumber, licensed master fire suppression piping contractor, registered design professional or an individual holding an appropriate certificate of fitness from the Fire Department for the operation and/or maintenance of such system shall certify on forms provided by the department that all required painting has been completed in accordance with Section 903.6. Such certification shall be maintained on the premises and made available for inspection by the department and the Fire Department.

## SECTION BC 904

### ALTERNATIVE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS

**904.1 General.** Automatic fire-extinguishing systems, other than automatic sprinkler systems, shall be designed, installed, inspected, tested and maintained in accordance with the provisions of this section, the *New York City Fire Code*, and the applicable referenced standards.

**904.1.1 Construction documents.** Construction documents for alternative automatic fire-extinguishing systems



tems shall be approved by the Fire Department and shall contain plans that include at least the following data and information:

1. Commercial kitchen suppression systems:
  - 1.1. Location of all surface, plenum and duct nozzles; surface dimensions and location of all cooking appliances; the location of automatic fuel shutoff and statement as to type (gas or electric); location and distance of the remote control or manual pull station;
  - 1.2. Identification of the grease filters to be used in any kitchen hood; the dimensions of all hoods and all related ducts, including termination of duct at the exterior of the building;
  - 1.3. Identification of the fire suppression piping system; the make and model of the system; the type of extinguishing agent and number and size of agent containers; size, length, and type of all piping that will be used; the number and location of all fusible links or detectors and the temperature setting; any surface, plenum and duct nozzles.
2. For extinguishing agent systems, the plan should also include type and concentration of the extinguishing agent, the method of providing power supply to smoke or heat detectors, fire rating of partitions, location of all audible/visible alarms within and outside the location involved and the details of construction of the room to contain the extinguishing agent. If the area is not sprinklered, the following information is required:
  - 2.1. The size and location of the reserve supply, and
  - 2.2. Information as to why it has been determined that water is not effective as an extinguishing agent for the fire hazard in such location.
3. The plans must note whether the proposed system is connected to the building's fire alarm system.

**Exception:** For that portion of a fire suppression piping system within an approved preengineered system, a schematic isometric diagram shall be acceptable in lieu of full plans, provided that the location and method of pressure relief must be indicated with areas and volumes to where said relief is taken.

**904.2 Where required.** Automatic fire-extinguishing systems installed as an alternative to the required automatic sprinkler systems of Section 903 shall be approved by the commissioner. Automatic fire-extinguishing systems shall not be considered alternatives for the purposes of exceptions or reductions allowed by other requirements of this code.

**Exception:** Automatic fire-extinguishing systems installed in Group H occupancies as an alternative to the required automatic sprinkler systems of Section 903 shall be approved by the fire commissioner.

**904.2.1 Hood system suppression.** Each required commercial kitchen exhaust hood and duct system required by

the *New York City Fire Code* or Chapter 5 of the *New York City Mechanical Code* to have a Type I hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code.

**904.3 Installation.** Automatic fire-extinguishing systems shall be installed in accordance with this section.

**904.3.1 Electrical wiring.** Electrical wiring shall be in accordance with the *New York City Electrical Code*.

**904.3.2 Actuation.** Automatic fire-extinguishing systems shall be automatically actuated and provided with a manual means of actuation in accordance with Section 904.11.1.

**904.3.3 System interlocking.** Automatic equipment interlocks with fuel shutoffs, ventilation controls, door closers, window shutters, conveyor openings, smoke and heat vents and other features necessary for proper operation of the fire-extinguishing system shall be provided as required by the design and installation standard utilized for the hazard.

**904.3.4 Alarms and warning signs.** Where alarms are required to indicate the operation of automatic fire-extinguishing systems, distinctive audible and visible alarms and warning signs shall be provided to warn of pending agent discharge. Where exposure to automatic-extinguishing agents poses a hazard to persons and a delay is required to ensure the evacuation of occupants before agent discharge, a separate warning signal shall be provided to alert occupants once agent discharge has begun. Audible signals shall be in accordance with Section 907.5.2.1.

**904.3.5 Monitoring.** Where a fire alarm system is installed, automatic fire-extinguishing systems shall be monitored by the fire alarm system in accordance with NFPA 72.

**904.4 Inspection and testing.** Automatic fire-extinguishing systems shall be inspected and tested in accordance with the provisions of this section and the *New York City Fire Code* prior to acceptance.

**904.4.1 Inspection.** Prior to conducting final acceptance tests, the following items shall be inspected:

1. Hazard specification for consistency with design hazard.
2. Type, location and spacing of automatic- and manual-initiating devices.
3. Size, placement and position of nozzles or discharge orifices.
4. Location and identification of audible and visible alarm devices.
5. Identification of devices with proper designations.
6. Operating instructions.

**904.4.2 Alarm testing.** Notification appliances, connections to fire alarm systems and connections to central supervising stations shall be tested in accordance with this section and Section 907 to verify proper operation.

**904.4.2.1 Audible and visible signals.** The audibility and visibility of notification appliances signaling agent discharge or system operation, where required, shall be verified.

**904.4.3 Monitor testing.** Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and retransmission of alarms from automatic fire-extinguishing systems.

**904.5 Wet-chemical systems.** Wet-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

**904.6 Dry-chemical systems.** Dry-chemical extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*. New dry-chemical extinguishing systems are not permitted for the protection of kitchen equipment.

**904.7 Foam systems.** Foam-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

**904.8 Carbon dioxide systems.** Carbon dioxide extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

**904.9 Halon systems.** Halogenated extinguishing systems shall not be permitted. However, existing systems shall be maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

**904.10 Clean-agent systems.** Clean-agent fire-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

**904.11 Commercial cooking systems.** The automatic fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Pre-engineered automatic wet-chemical extinguishing systems shall be approved by the fire commissioner, tested in accordance with UL 300, and listed and labeled for the intended application. The protected area shall include the area under the hood and over the cooking equipment, the area above or behind the filters and the opening of the hood into the branch duct. Where a preengineered system is installed and the size of the protected area exceeds that allowed for a single preengineered system, additional preengineered systems arranged for simultaneous operation shall be provided. Other types of automatic fire-extinguishing systems shall be listed and labeled for specific use as protection for commercial cooking operations. The system shall be installed in accordance with this code, its listing and the manufacturer's installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the *New York City Fire Code* and the referenced standard indicated, as shown:

1. Carbon dioxide extinguishing systems, in accordance with the *New York City Fire Code*.
2. Wet-chemical extinguishing systems, in accordance with the *New York City Fire Code*.

**904.11.1 Manual system operation.** A manual actuation device shall be located at or near a means of egress from the cooking areas, a minimum of 10 feet (3048 mm) and a maximum of 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be installed not more than 48 inches (1200 mm) or less than 42 inches (1067 mm) above the floor and shall clearly identify the hazard protected. The manual actuation device shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

**Exception:** Automatic sprinkler systems shall not be required to be equipped with manual actuation means.

**904.11.2 System interconnection.** The actuation of the fire suppression system shall automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical supply reset shall be manual.

**904.11.3 Carbon dioxide systems.** When carbon dioxide systems are used, there shall be a nozzle at the top of the ventilating duct. Additional nozzles that are symmetrically arranged to give uniform distribution shall be installed within vertical ducts exceeding 20 feet (6096 mm) and horizontal ducts exceeding 50 feet (15 240 mm). Dampers shall be installed at either the top or the bottom of the duct and shall be arranged to operate automatically upon activation of the fire-extinguishing system. Where the damper is installed at the top of the duct, the top nozzle shall be immediately below the damper. Automatic carbon dioxide fire-extinguishing systems shall be sufficiently sized to protect against all hazards venting through a common duct simultaneously.

**904.11.3.1 Ventilation system.** Commercial-type cooking equipment protected by an automatic carbon dioxide-extinguishing system shall be arranged to shut off the ventilation system upon activation.

**904.12 Water-mist systems.** Water-mist fire-extinguishing systems shall be installed, maintained, periodically inspected and tested in accordance with the *New York City Fire Code*.

## SECTION BC 905 STANDPIPE SYSTEMS

**905.1 General.** Standpipe systems shall be provided in buildings and structures in accordance with this section. Fire hose threads used in connection with standpipe systems shall be approved by the fire commissioner. Standpipe systems in buildings used for high-piled combustible storage shall be in accordance with the *New York City Fire Code*. Installation of standpipe systems shall comply with the special inspection requirements of Chapter 17.

Any space or room that contains equipment of such nature that the use of water would be ineffective in fighting a fire therein, or would be otherwise hazardous, shall have a conspicuous sign on each door opening on such space or room stating the nature of the use and the warning: "IN CASE OF FIRE, USE NO WATER."

**905.1.1 Construction documents.** Construction documents for standpipe systems shall contain plans that include at least the following data and information:

1. The locations and sizes of all risers, cross-connections, hose racks, valves, Fire Department connections, sources of water supply, piping, and other essential features of the system;
2. A floor plan for each group of floors that have typical riser locations and no special features within such group of floor levels, with the indication in title block of such plan indicating clearly the floors to which the arrangement is applicable;
3. A riser diagram showing the essential features of the system, including the risers, cross-connections, valves, Fire Department connections, tanks, pumps, sources of water supply, pipe sizes, capacities, floor heights, zone pressures, and other essential data and features of the system; and
4. The available water pressure at the top and bottom floors of each zone, and at each floor where the weight pipe fittings change, shall be shown on the riser diagram;
5. For street pressure-fed systems and fire pumps, a statement from the New York City Department of Environmental Protection, giving the minimum water pressure in the main serving the building.

**905.2 Installation standards.** Standpipe systems shall be installed in accordance with this section and NFPA 14 as modified in Appendix Q.

**905.3 Required installations.** Standpipe systems shall be installed where required by Sections 905.3.1 through 905.3.6 and in the locations indicated in Sections 905.4, 905.5 and 905.6. Standpipe systems are allowed to be combined with automatic sprinkler systems.

**Exception:** Standpipe systems are not required in buildings occupied entirely by Group R-3.

**905.3.1 Applicability.** Class III standpipe systems shall be installed throughout the following buildings:

1. In buildings two stories or more in height with floor area of 10,000 square feet (929 m<sup>2</sup>) or greater on any story;
2. In buildings three stories or more in height with floor area of 7,500 square feet (697 m<sup>2</sup>) or greater on any story;
3. In buildings of any area with a floor level having an occupant load of 30 or more that is located 55 feet (16 764 mm) or more above the lowest level of Fire Department vehicle access;
4. In buildings of any area, constructed in accordance with Section 403, with occupied floors located 75 feet (22 860 mm) or more above the lowest level of Fire Department vehicle access.

**Exceptions:** The following exceptions are allowed as an alternative to the requirement of a Class III standpipe system:

1. Class I standpipes are allowed in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 provided that the following additional requirements are met:

- 1.1. A locked storage cabinet shall be provided on the main entrance floor. One additional locked storage cabinet shall be provided on every tenth floor above the main entrance floor, such that no occupant on any floor would have to travel more than five floors to reach a cabinet in a location within 15 feet of standpipe riser. Where one standpipe riser is installed in the building, such cabinet shall contain at least one fog nozzle, one 1.5-inch (38 mm) spanner wrench, one 2.5-inch (64 mm) spanner wrench, one 2.5-inch (64 mm) by 1.5 inch (38 mm) nonswivel reducing coupling, and 125 feet (38 m) of 1.5 inch (38 mm) hose. Where two or more standpipe risers are installed in the building, at least two of each of the above items of equipment shall be provided. However, the hose may be omitted when serving Group R-2 occupancies.

- 1.1.1. The cabinet shall be kept locked, openable by a Fire Department citywide standard key.

- 1.1.2. The cabinet shall be labeled, "FOR FIRE DEPARTMENT USE ONLY."

- 1.1.3. A metal sign stating clearly where the storage cabinet is located shall be placed in each stair enclosure on the main entrance floor and on each floor where the cabinet is located.

- 1.2. Hose valves are capped with a hose valve cap fastened to the valve with a chain.

2. Class I manual standpipes are allowed in open parking garages where the highest floor is located not more than 150 feet (45 720 mm) above the lowest level of Fire Department vehicle access.
3. Class I manual dry standpipes are allowed in open parking garages that are subject to freezing temperatures, provided that the hose connections are located as required for Class II standpipes in accordance with Section 905.5.
4. Class I standpipes are allowed in below-grade stories equipped throughout with an automatic sprinkler system.
5. Standpipe outlets may be omitted in portions of first floors or basements that are completely separated from the entrance hall or enclosed stairways leading to the upper floors, provided that portable fire extinguishers are installed, subject to the approval of the fire commissioner.



**905.3.2 Group A.** Class I automatic wet standpipes shall be provided in nonsprinklered Group A buildings having an occupant load exceeding 1,000 persons.

**Exceptions:**

1. Open-air-seating spaces without enclosed spaces.
2. Class I automatic dry and semiautomatic dry standpipes or manual wet standpipes are allowed in buildings where the highest floor surface used for human occupancy is 75 feet (22 860 mm) or less above the lowest level of Fire Department vehicle access. Dry standpipes are permitted only where subject to freezing temperatures.

**905.3.3 Covered mall buildings.** Covered mall buildings and buildings connected thereto shall be equipped throughout with a Class I automatic wet standpipe system, except as permitted by Sections 905.3.3.1 through 905.3.3.3.

**905.3.3.1 Covered-mall building height.** Covered-mall buildings where the highest occupied floor level is located not more than 30 feet (9144 mm) above the lowest level of the Fire Department vehicle access shall be permitted to be provided with Class I hose connections connected to the mall sprinkler system in accordance with Section 8.17.5.2 of NFPA 13 regarding hose connections for Fire Department use and under the following conditions:

1. Any individual outlet shall be capable of delivering water flow at a rate of 250 gallons per minute (946 L/m) while concurrently supplying the mall sprinkler demand; and
2. Each of the two most hydraulically remote outlets shall be capable of concurrently delivering 250 gallons per minute (946 L/m) at a pressure of 100 pounds per square inch (689.4 kPa) with no mall sprinkler demand, based on a supply pressure at the system Fire Department connection of not more than 175 pounds per square inch (1207 kPa). Adequacy of the water supply available to the Fire Department to meet the hydraulic calculations shall be demonstrated by the registered design professional.

**905.3.3.2 Location of hose connections.** Hose connections shall be provided in accordance with Section 905.4 and at each of the following locations:

1. Within the mall at the entrance to each exit passageway or exit.
2. At each floor-level landing within enclosed stairways opening directly on the mall.
3. At exterior public entrances to the mall.
4. At other locations as necessary so that the distance to reach all portions of a tenant space does not exceed 150 feet (45 720 mm) from a hose connection.

**905.3.3.3 Installation standard.** Except as provided in Sections 905.3.3.1 and 905.3.3.2, the Class I hose con-

nections and Fire Department connections shall be designed in conformance with NFPA 14.

**905.3.4 Stages.** Stages greater than 1,000 square feet in area (93 m<sup>2</sup>) and any assembly occupancy with a stage and an occupant load of 1,000 or greater shall be equipped with a Class III wet standpipe system with 1½-inch and 2½-inch (38 mm and 64 mm) hose connections on each side of the stage.

**905.3.4.1 Hose and cabinet.** The 1½-inch (38 mm) hose connections shall be equipped with sufficient lengths of 1½-inch (38 mm) hose to provide fire protection for the stage area. Hose connections shall be equipped with an approved adjustable fog nozzle and be mounted in a cabinet or on a rack.

**905.3.5 Underground buildings.** Underground buildings shall be equipped throughout with a Class I automatic wet or manual wet standpipe system.

**905.3.6 Helistops and heliports.** Buildings with a heli-stop or heliport that are equipped with a standpipe shall extend the standpipe to the roof level on which the heli-stop or heliport is located in accordance with the *New York City Fire Code*. All portions of the heli-stop and heliport area shall be within 150 feet (45 720 mm) of a 2½-inch (64 mm) outlet on a Class I or III standpipe, in accordance with the *New York City Fire Code*.

**905.3.7 Marinas and boatyards.** Standpipes in marinas and boatyards shall comply with the *New York City Fire Code* or other requirements of the Fire Department.

**905.4 Location of Class I standpipe hose connections.** Class I standpipe hose connections shall be provided in all of the following locations:

1. In every required stairway, a hose connection shall be provided for each floor level above or below grade. Hose connections shall be readily accessible and located at the riser on each floor-level landing and on the entrance floor above the standpipe riser control valve. Nonrequired enclosed stairways are not required to have hose connections. Stairways without hose connections shall have a sign on the door to the stairway stating, "No standpipe connections in stairway."
2. On each side of the wall adjacent to the exit opening of a horizontal exit.

**Exception:** Where floor areas adjacent to a horizontal exit are reachable from exit stairway hose connections by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the horizontal exit.

3. In every exit passageway at the entrance from the exit passageway to the other areas of a building.

**Exception:** Where floor areas adjacent to an exit passageway are reachable from exit stairway hose connections by a 30-foot (9144 mm) hose stream from a nozzle attached to 100 feet (30 480 mm) of hose, a hose connection shall not be required at the



entrance from the exit passageway to other areas of the building.

NYC 4. In covered mall buildings, in accordance with Section 905.3.3.2.

NYC 5. Where the roof has a slope of less than four units vertical in 12 units horizontal (33.3-percent slope), each standpipe shall be provided with a hose connection located either on the roof or at the highest landing of stairways with stair access to the roof. An additional hose connection shall be provided at the top of the most hydraulically remote standpipe for testing purposes.

NYC 6. Where the most remote portion of a floor or story is more than 150 feet (45 720 mm) from a hose connection, additional hose connections shall be provided in approved locations. For the purposes of this section, a penthouse with an occupant load greater than 10 shall be considered a story.

NYC **905.4.1 Protection.** Risers and laterals of Class I standpipe systems not located within an enclosed stairway or pressurized enclosure shall be protected by a degree of fire resistance equal to that required for vertical enclosures in the building in which they are located. No standpipe riser shall be placed in any shaft containing a gas or fuel pipeline.

NYC **Exception:** In buildings equipped throughout with an approved automatic sprinkler system, laterals that are not located within an enclosed stairway or pressurized enclosure are not required to be enclosed in fire-resistance-rated construction.

**905.4.2 Interconnection.** In buildings where more than one standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

NYC **905.5 Location of Class II standpipe hose connections.** Class II standpipe hose connections shall be accessible and located in accordance with Section 905.3.4.

NYC **905.5.1 Reserved.**

⇒ **905.5.2 Protection.** Fire-resistance-rated protection of risers and laterals of Class II standpipe systems is not required.

**905.6 Location of Class III standpipe hose connections.** Class III standpipe systems shall have hose connections located as required for Class I standpipes in Section 905.4 and shall have Class II hose connections as required in Section 905.5.

**905.6.1 Protection.** Risers and laterals of Class III standpipe systems shall be protected as required for Class I systems in accordance with Section 905.4.1.

NYC **905.6.2 Interconnection.** In buildings where more than one standpipe is provided, the standpipes shall be interconnected in accordance with NFPA 14.

**905.7 Cabinets.** Cabinets containing fire-fighting equipment such as standpipes, fire hoses, fire extinguishers or Fire Department valves shall not be blocked from use or obscured from view.

**905.7.1 Cabinet equipment identification.** Cabinets shall be identified in an approved manner by a permanently attached sign with white letters not less than 2 inches (51 mm) high and a red background color, indicating the equipment contained therein. NYC

**Exception:** Doors that have either an approved visual identification clear glass panel or a complete glass door panel are not required to be marked. NYC

**905.7.2 Locking cabinet doors.** Cabinets shall be unlocked.

**Exceptions:**

1. Visual identification panels of glass or other approved transparent frangible material that is easily broken and allows access.
2. Approved locking arrangements.
3. Locking of cabinets shall be permitted in Group I-3. NYC

**905.8 Dry standpipes.** Dry standpipes shall not be installed.

**Exception:** Where subject to freezing and in accordance with NFPA 14.

**905.9 Valve supervision.** Valves controlling water supplies shall be supervised in the open position so that a change in the normal position of the valve will generate a supervisory signal at the central supervising station required by Section 903.4. Where a fire alarm system is provided, a signal shall also be transmitted to the fire alarm system. NYC

**Exceptions:**

1. Valves to underground key or hub valves in roadway boxes provided by the city or a public utility do not require supervision. NYC
2. Valves locked in the normal position and inspected as provided in this code in buildings not equipped with a fire alarm system.

**905.10 During construction.** Standpipe systems required during construction, alteration and demolition operations shall be provided in accordance with Section 3303.8. NYC

**905.11 Painting of dedicated standpipes.** Dedicated standpipes and the handles of valves serving standpipes shall be painted and such painting certified in accordance with Sections 905.11.1 through 905.11.6. In addition to painting, standpipe piping may also be identified by lettered legend in accordance with ANSI A13.1. Where the piping is required to be listed and labeled such painting shall not obscure such labeling. NYC

**Exceptions:**

1. Attachments, gauges, valves and operable parts of standpipes other than valve handles. NYC
2. Where different color coding may be required by Section 3406 of the *New York City Fire Code* for facilities storing, handling, and using flammable and combustible liquids in connection with special operations. NYC

**905.11.1 New buildings.** All portions of a standpipe system and the handles of valves serving the standpipe sys- NYC

tem in new buildings, including buildings constructed pursuant to Section 28-101.4.2 of the *Administrative Code*, shall be painted red prior to the hydrostatic pressure test whether or not they are intended to be enclosed at the end of construction.

**905.11.2 Alterations.** Existing handles of valves serving existing standpipe systems and existing unpainted standpipe risers that are exposed during alterations, including alterations pursuant to Section 28-101.4.2 of the *Administrative Code* shall be painted red. Where the alteration requires a hydrostatic pressure test such painting shall be completed prior to such test.

**905.11.3 Retroactive requirement for completed buildings.** Notwithstanding any other provision of law, all portions of exposed standpipe systems and handles of valves serving the standpipe system of completed buildings in existence March 2, 2010 shall be painted red by June 2, 2010.

**905.11.4 Buildings under construction.** Notwithstanding any other provision of law, where construction documents were approved and permits issued for the construction of a new building or alteration of an existing building prior to March 2, 2010 and the work is not signed off by the department prior to such date, all exposed portions of the standpipe system and handles of valves serving the standpipe system shall be painted red prior to the hydrostatic pressure test, including portions that will be enclosed at a later point in time.

**Exception:** Portions of the standpipe system enclosed prior to March 2, 2010 need not be painted.

**905.11.5 Combination standpipe and sprinkler systems.** Where a standpipe system that is used as a combination standpipe and sprinkler system is required to be painted pursuant to Section 905.11.1, 905.11.2, 905.11.3 or 905.11.4, the sprinkler risers and cross connections that are also used for the standpipe system shall be painted red, and the handles of valves serving such combination standpipe and sprinkler system shall be painted yellow.

**905.11.6 Certification of completion of system painting.** For all buildings where standpipe and combination sprinkler and standpipe systems are not subject to a special inspection pursuant to Section 1704.24 of this code, a licensed master plumber, licensed master fire suppression piping contractor, registered design professional or an individual holding an appropriate certificate of fitness from the Fire Department for the operation and/or maintenance of such system shall certify on forms provided by the department that all required painting has been completed in accordance with Section 905.11. Such certification shall be maintained on the premises and made available for inspection by the department and the Fire Department.

## SECTION BC 906 PORTABLE FIRE EXTINGUISHERS

**906.1 General.** Portable fire extinguishers shall be provided in occupancies and locations as required by the *New York City Fire Code*.

## SECTION BC 907 FIRE ALARM AND DETECTION SYSTEMS

**907.1 General.** This section covers the application, installation, performance and maintenance of fire alarm systems and their components. Systems shall be designed and installed in accordance with NFPA 72 as modified in Appendix Q and the *New York City Electrical Code*.

**907.1.1 Construction documents.** Construction documents for fire alarm systems shall be submitted for review and approval to the department and the Fire Department prior to system installation. Construction documents shall include, but not be limited to, all of the following:

1. A floor plan that indicates the use of all rooms.
2. Locations of alarm-initiating devices.
3. Locations of alarm notification appliances, including candela ratings for visible alarm notification appliances.
4. Location of fire command center, fire alarm control units, transponders and notification power supplies.
5. Location of remote annunciators.
6. Location of all primary, secondary and local sources of power.
7. Fire alarm riser diagram showing all fire alarm devices indicated on the floor plans. Quantities of devices on the floor plans shall match the quantities indicated on the riser diagram. Riser diagram shall include class and style of circuits and levels of survivability. The riser diagram shall show the interface of fire safety control functions.
8. Copies of any variances granted by the department or the Fire Department.
9. Legend of all fire alarm symbols and abbreviations used.
10. Design criteria for fire alarm audibility in various occupancies indicated on plans.
11. Fire alarm sequence of operation for the fire alarm system in a matrix format.
12. Classification of the central supervising station.

**907.1.1.1 Amended construction documents.** Amendments to approved construction documents shall be submitted, reviewed and approved before the final inspection of the work or equipment is completed, and such amendments when approved shall be deemed part of the original construction documents. The department may allow minor revisions of construction documents to be made and submitted to the department after the

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completion of work but prior to sign-off of the work in accordance with department rules.

**907.1.2 Equipment.** Systems and their components shall be listed for the purpose for which they are installed. The fire alarm control unit shall meet the requirements of the Fire Department.

**907.2 Where required.** An approved fire alarm system installed in accordance with the provisions of this code and NFPA 72 as modified by Appendix Q shall be provided in accordance with Sections 907.2.1 through 907.2.22 and provide occupant notification in accordance with Section 907.5, unless other requirements are provided by another section of this code.

A minimum of one manual fire alarm box shall be provided in an approved location to initiate a fire alarm signal for fire alarm systems employing automatic fire detectors or waterflow detection devices. Where other sections of this code allow elimination of fire alarm boxes due to sprinklers, a single fire alarm box shall be installed.

#### Exceptions:

1. The manual fire alarm box is not required for fire alarm systems dedicated to elevator recall control and supervisory service.
2. The manual fire alarm box is not required for Group R-2 occupancies unless required by the Fire Department to provide a means for fire watch personnel to initiate an alarm during a sprinkler system impairment event. Where provided, the manual fire alarm box shall not be located in an area that is accessible to the public.

In all occupancies where an automatic fire alarm system is required by this section, selective coverage smoke detectors shall be located as follows, unless partial or total coverage automatic detection is specified.

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room, in elevator machine rooms, and in elevator lobbies.
2. In air distribution systems in accordance with Section 606 of the *New York City Mechanical Code*.

**907.2.1 Group A.** A manual and automatic fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group A occupancies having an occupant load of 300 or more. Portions of Group E occupancies occupied for assembly purposes shall be provided with a fire alarm system as required for the Group E occupancy.

#### Exceptions:

1. Manual fire alarm boxes are not required where the building is equipped throughout with an automatic sprinkler system and the notification appliances will activate upon sprinkler water flow. This exception shall not apply to Group A-2 occupancies used as a cabaret.
2. A Group A-2 occupancy used as a cabaret with an occupant load of 75 or more, including associated stages, dressing rooms, and property rooms,

shall be equipped with a manual fire alarm system. Such a Group A-2 occupancy with an occupant load of 300 or more shall also be equipped with an automatic fire alarm system.

3. Group A occupancies with a stage in accordance with Section 410, and having an occupant load of 75 or more, shall be provided with a voice/alarm communication system as required by Sections 410.8 and 907.2.1.1.

#### 907.2.1.1 System initiation in Group A occupancies.

Activation of the fire alarm in Group A-1 occupancies with an occupant load of 300 or more, and in all other Group A occupancies with an occupant load of 1,000 or more, shall initiate a presignal system in accordance with NFPA 72 as amended by Appendix Q at a constantly attended location from which the Fire Department shall be notified and live voice evacuation instructions shall be initiated using an emergency voice/alarm communications system in accordance with Section 907.5.2.2.

**907.2.2 Group B.** A manual and automatic fire alarm system shall be installed in Group B occupancies that are protected by an automatic sprinkler system where one of the following conditions exists:

1. The combined Group B occupant load of all floors is 500 or more.
2. The Group B occupant load is more than 100 persons above or below the lowest level of exit discharge.
3. The Group B fire area contains a Group B ambulatory health care facility.

Where such occupancies meeting any one of the above conditions are not protected by an automatic sprinkler system, a partial coverage automatic smoke detection or automatic heat detection system shall be installed in accordance with NFPA 72 in addition to the manual and automatic fire alarm system.‡

#### 907.2.2.1 Group B ambulatory health care facilities.

Fire areas containing Group B ambulatory health care facilities shall be provided with an electronically supervised automatic partial-coverage smoke detection system installed within the ambulatory health care facility and in public use areas outside of tenant spaces and along the path of egress, including public corridors and elevator lobbies.

**Exception:** Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, provided the occupant notification appliances will activate throughout the notification zones upon sprinkler waterflow.

**907.2.2.2 Large-area buildings.** Group B occupancies having a total gross area exceeding 100,000 square feet (9290 m<sup>2</sup>) located in buildings where the highest occupied floor is less than 75 feet above the lowest level of Fire Department vehicle access shall be provided with automatic smoke detection connected to an automatic fire alarm system in accordance with Section



907.2.13.1 and emergency voice/alarm communication system in accordance with Section 907.5.2.2 that initiates a total evacuation signal.

**907.2.3 Group E.** A manual and automatic fire alarm system shall be installed in Group E occupancies. When automatic sprinkler systems or smoke detectors are installed, such systems or detectors shall be connected to the building fire alarm system.

**907.2.4 Group F.** A manual and automatic fire alarm system shall be installed in Group F occupancies that are two or more stories in height and have an occupant load of 100 or more, or when 25 persons or more are above or below the lowest level of exit discharge.

**907.2.5 Group H.** A manual and automatic fire alarm system shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. In addition to the automatic fire alarm system requirements of Section 907.2, an automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers in accordance with the *New York City Fire Code*, and shall be connected to a central supervising station.

**Exceptions:** A smoke detection system shall not be required in detached storage buildings equipped throughout with an approved automatic fire-extinguishing system and used only to store the following:

1. Organic peroxides.
2. Liquid or solid oxidizers.

**907.2.6 Group I.** A manual and automatic fire alarm system that activates the occupant notification system shall be installed in Group I occupancies. An automatic smoke detection system that activates the occupant notification system shall be provided in accordance with Sections 907.2.6.1, 907.2.6.2 and 907.2.6.3.3.

**907.2.6.1 Group I-1.** An automatic smoke detection system shall be installed in corridors, waiting areas open to corridors and habitable spaces other than sleeping units and kitchens. The system shall be activated in accordance with Section 907.5.

**Exception:** Smoke detection is not required for exterior balconies.

**907.2.6.1.1 Smoke detectors within dwelling and sleeping units.** Smoke detectors and notification appliances shall be installed in dwelling units and such notification appliances shall activate only in the unit in which the alarm originates. Such detectors and appliances shall be annunciated by a† dwelling unit at a constantly attended location from which the fire alarm system is capable of being manually activated. Smoke detectors are required in the following areas:

1. Sleeping areas;
2. Every room in the path of the means of egress from the sleeping area to the door leading from the dwelling unit;

3. Each story within the unit, including below-grade stories. For dwelling units with split levels and without an intervening door between the adjacent levels, a smoke detector installed on the upper level shall suffice for the adjacent lower level.

**907.2.6.2 Group I-2.** An automatic smoke detection system shall be installed in corridors in nursing homes (both intermediate-care and skilled nursing facilities), corridors in detoxification facilities and spaces permitted to be open to the corridors by Section 407.2. The system shall be activated in accordance with Section 907.5. Hospitals shall be equipped with smoke detection as required in Section 407. A one-way voice communication system activated in accordance with Section 907.5.2.2 shall be provided at the fire command center for use by Fire Department personnel.

**907.2.6.2.1 Group I-2 hospital buildings.** Group I-2 hospital buildings where the highest occupied floor is less than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access shall be provided with partial coverage automatic smoke detection connected to an automatic fire alarm system in accordance with Section 907.2.13.1 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

**907.2.6.3 Group I-3.** Group I-3 occupancies shall be equipped with a manual and automatic fire alarm system and automatic smoke detection system installed for alerting staff.

**907.2.6.3.1 System initiation.** Actuation of an automatic fire-extinguishing system, a manual fire alarm box or a smoke detector shall initiate an approved alarm signal that automatically notifies staff.

**907.2.6.3.2 Manual fire alarm boxes.** Manual fire alarm boxes are not required to be located in accordance with Section 907.4.2 where the fire alarm boxes are provided at staff-attended locations having direct supervision over areas where manual fire alarm boxes have been omitted.

**907.2.6.3.2.1 Manual fire alarm boxes in detainee areas.** Manual fire alarm boxes are allowed to be locked in areas occupied by detainees, provided that staff members are present within the subject area and have keys readily available to operate the manual fire alarm boxes.

**907.2.6.3.3 Automatic smoke detection system.** An automatic smoke detection system shall be installed throughout resident housing units, including sleeping areas and contiguous day rooms, group activity spaces and other common spaces normally accessible to residents.

**Exceptions:**

1. Other approved smoke detection arrangements providing equivalent protection including, but not limited to,



placing detectors in exhaust ducts from cells or behind protective guards listed for the purpose are allowed when necessary to prevent damage or tampering.

2. Sleeping units in Use Conditions 2 and 3.
3. Smoke detectors are not required in sleeping units with four or fewer occupants in smoke compartments that are equipped throughout with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1.

**907.2.7 Group M.** A manual and automatic fire alarm system shall be installed in Group M occupancies where any one of the following conditions exists:

1. Where a Group M fire area exceeds 12,000 square feet (1115 m<sup>2</sup>);
2. Where a Group M fire area is located more than three stories above grade;
3. Where the combined area of all Group M fire areas on all floors, including mezzanines, exceeds 24,000 square feet (2230 m<sup>2</sup>); or
4. Where a Group M fire area in a below-grade story exceeds 1,500 square feet (139 m<sup>2</sup>).

Where such occupancies are not protected by an automatic sprinkler system, a manual fire alarm and partial coverage automatic smoke detection or automatic heat detection system shall be installed in accordance with NFPA 72.

**907.2.7.1 Large-area buildings.** Group M occupancies having a total gross area exceeding 100,000 square feet (9290 m<sup>2</sup>) located in buildings where the highest occupied floor is less than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access and covered mall buildings having a total gross area exceeding 50,000 square feet (4645 m<sup>2</sup>) shall be provided with automatic smoke detection connected to an automatic fire alarm system in accordance with Section 907.2.13.1 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2 initiating a total evacuation signal.

**907.2.8 Group R-1.** Fire alarm systems shall be installed in Group R-1 occupancies as required in Sections 907.2.8.1 through 907.2.8.4.

**907.2.8.1 Manual fire alarm system.** A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group R-1 occupancies.

**Exception:** A manual fire alarm system is not required in buildings not over two stories in height where all individual dwelling units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least 1-hour fire

partitions and each individual dwelling unit has an exit directly to a public way, exit court or yard.

**907.2.8.2 Automatic smoke detection system.** An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be installed in all public corridors serving dwelling units and in accordance with Section 907.2.8.3.

**Exception:** An automatic fire detection system is not required in buildings that do not have public corridors serving dwelling units and each dwelling unit has a means of egress door opening directly to an exterior exit access that leads directly to an exit.

**907.2.8.3 Smoke detectors within dwelling units.** Smoke detectors and audible notification appliances shall be installed in dwelling units and shall be annunciated by dwelling unit at a constantly attended location from which the fire alarm system is capable of being manually activated. Smoke detectors are required in the following areas:

1. In sleeping areas.
2. In every room in the path of the means of egress from the sleeping area to the door leading from the dwelling unit.
3. In each story within the unit, including below-grade stories. For dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level.

**907.2.8.4 Large Group R-1 occupancies.** Group R-1 occupancies with a total of more than 50 sleeping rooms above street level located in buildings where the highest occupied floor is less than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access, or communal sleeping facilities above street level occupied or designed to be occupied by more than 50 lodgers, shall be provided with automatic smoke detection connected to an automatic fire alarm system in accordance with Section 907.2.13.1 and an emergency voice/alarm communication system in accordance with Section 907.5.2.2 that initiates a total evacuation signal.

**907.2.9 Group R-2.** A fire alarm system without alarm notification appliances and smoke alarms shall be installed in accordance with this section in Group R-2 occupancies, other than student apartments, where such occupancy satisfies any one of the following conditions:

1. Any dwelling unit is located three or more stories above the lowest level of exit discharge, including dwelling units in penthouses of any area;
2. Any dwelling unit is located more than one story below the highest level of exit discharge of exits serving the dwelling unit; or
3. The building contains more than 16 dwelling units.

Actuation of smoke detectors shall not initiate a signal to alarm notification appliances. The activation of any detector required by this section shall initiate a signal at a central station or a constantly attended location. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room, greater than 75 square feet (6.96 m<sup>2</sup>) in area.
2. In air distribution systems in accordance with Section 606 of the *New York City Mechanical Code*.
3. In elevator machine rooms and in elevator lobbies.

**907.2.9.1 Group R-2 student apartments.** Where the main use or dominant occupancy of a building is classified as R-2 student apartments, as defined in Section 310.2, fire alarm systems shall be installed in accordance with Section 907.2.8. Where the main use or dominant occupancy of a building is not classified as R-2 student apartments and the building is occupied partially by Group R-2 student apartments, fire alarm systems shall be installed in accordance with Sections 907.2.9.1.1 through 907.2.9.2.

**907.2.9.1.1 Manual fire alarm system.** A manual fire alarm system shall be installed throughout all public corridors serving student apartments and student-related uses. Student-related uses shall include common spaces such as recreation rooms, lounges, dining rooms, laundry rooms and storage rooms.

**Exceptions:**

1. A manual fire alarm system is not required in buildings not over two stories in height where all individual dwelling units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least 1-hour fire partitions and each individual dwelling unit has an exit directly to a public way, exit court or yard.
2. A manual fire alarm system is not required in buildings containing fewer than 15 student apartments.

**907.2.9.1.2 Automatic fire alarm system.** An automatic fire alarm system without alarm notification appliances shall be installed in accordance with this section in Group R-2 student apartments and student-related uses. The activation of any smoke detector required by this section shall initiate a signal at a central station or a constantly attended location. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room, in elevator machine rooms, and in elevator lobbies.
2. In air distribution systems in accordance with Section 606 of the *New York City Mechanical Code*.

3. Throughout all public corridors serving student apartments and student-related uses. Student-related uses shall include common spaces such as recreation rooms, lounges, dining rooms, laundry rooms and storage rooms. However, smoke detectors shall not be required in such public corridors in buildings containing fewer than 15 student apartments.

**Exception:** An automatic fire alarm system is not required in buildings not over two stories in height where all individual dwelling units and contiguous attic and crawl spaces are separated from each other and public or common areas by at least 1-hour fire barriers and each individual dwelling unit has an exit directly to a public way, exit court or yard.

**907.2.9.2 Smoke alarms.** Single- and multiple-station smoke alarms shall be installed in accordance with Section 907.12.11.

**907.2.10 Reserved.**

**907.2.11 Single- and multiple-station smoke alarms.** Listed single- and multiple-station smoke alarms complying with UL 217 shall be installed in accordance with Sections 907.2.11.1 through 907.2.11.4 and NFPA 72.

**907.2.11.1 Smoke alarms in Groups R-2, R-3, and I-1.**

Single- or multiple-station smoke alarms shall be installed and maintained in Groups R-2, R-3, and I-1, regardless of occupant load at all of the following locations within all dwelling units:

1. On the ceiling or wall outside of each room used for sleeping purposes within 15 feet (4572 mm) from the door to such room.
2. In each room used for sleeping purposes.

**Exception:** Single- or multiple-station smoke alarms in Group I-1 shall not be required where smoke detectors are provided in the sleeping rooms as part of an automatic smoke detection system.

3. In each story within a dwelling unit, including below-grade stories and penthouses of any area, but not including crawl spaces and uninhabitable attics. In dwellings or dwelling units with split levels and without an intervening door between the adjacent levels, a smoke alarm installed on the upper level shall suffice for the adjacent lower level provided that the lower level is less than one full story below the upper level.

**907.2.11.2 Power source.** Required smoke alarms shall receive their primary power from a dedicated branch circuit or the unswitched portion of a branch circuit also used for power and lighting, and shall be equipped with a battery backup. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for over-current protection.

**Exception:** Smoke alarms with integral strobes shall not require battery backup provided that the smoke alarms are connected to an emergency electrical source.

**907.2.11.3 Interconnection.** Where more than one smoke alarm or detector is required to be installed within an individual dwelling unit in Group I-1, R-2, R-3, or within an individual dwelling unit or sleeping unit in Group R-1, the smoke alarms or detectors shall be interconnected in such a manner that the activation of one alarm or detector will activate all of the alarms or detectors in the individual unit. The alarm or detector shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

**907.2.11.4 Group R-2 occupancy.** Smoke alarms shall be provided with the capability to support visible alarm notification appliances in accordance with ICC/ANSI A117.1.

**907.2.12 Special amusement buildings.** An automatic smoke detection system shall be provided in special amusement buildings in accordance with Sections 907.2.12.1 through 907.2.12.3.

**Exception:** In areas where ambient conditions will cause a smoke detection system to alarm, an approved alternative type of automatic detector shall be installed.

**907.2.12.1 Alarm.** Activation of any single smoke detector, the automatic sprinkler system or any other automatic fire detection device shall immediately sound an alarm at the building at a constantly attended location from which emergency action can be initiated, including the capability of manual initiation of requirements in Section 907.2.12.2.

**907.2.12.2 System response.** The following minimum system actuations and responses shall be required upon approval by the department and the Fire Department. The activation of two or more smoke detectors, a single smoke detector with alarm verification, the automatic sprinkler system or other approved fire detection device shall automatically:

1. Cause illumination of the means of egress with light of not less than 1 foot-candle (11 lux) at the walking surface level;
2. Stop any conflicting or confusing sounds and visual distractions; and
3. Activate an approved directional exit marking that will become apparent in an emergency; and
4. Activate a prerecorded message, clearly audible throughout the special amusement building, instructing patrons to proceed to the nearest exit. Alarm signals used in conjunction with the prerecorded message shall produce a sound that is distinctive from other sounds used during normal operation.

**907.2.12.3 Emergency voice/alarm communication system.** An emergency voice/alarm communication

system, which is also allowed to serve as a public address system, shall be installed in accordance with Section 907.5.2.2, and be audible throughout the entire special amusement building.

**907.2.13 High-rise buildings.** In addition to the requirements of Sections 907.2.1 through 907.2.12, buildings constructed in accordance with Section 403 and having floors used for human occupancy located more than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access shall be provided with automatic smoke detection connected to an automatic fire alarm system in accordance with Section 907.2.13.1, a Fire Department communication system in accordance with Section 907.2.13.2, a two-way communication system in accordance with Section 907.2.13.3, and an emergency voice/alarm communication system in accordance with Section 907.5.2.2.

#### Exceptions:

1. Open parking garages in accordance with Section 406.3.
2. Buildings with an occupancy in Group A-5 in accordance with Section 303.1.
3. Special occupancies in accordance with Section 503.1.1.
4. Buildings with an occupancy in Group H-1, H-2 or H-3 in accordance with Section 415.

**907.2.13.1 Automatic smoke detection.** In addition to smoke detection otherwise required by this code, automatic smoke detection in high-rise buildings shall be in accordance with Sections 907.2.13.1.1 and 907.2.13.1.2.

**Exception for Group R-2 occupancies:** In R-2 occupancies, the activation of smoke detectors shall initiate a signal at a central supervising station or a constantly attended location and shall not initiate a signal to an alarm notification appliances.

**907.2.13.1.1 Automatic smoke detection.** Automatic smoke detectors shall be provided in accordance with this section. Smoke detectors shall be connected to an automatic fire alarm system. The activation of any detector required by this section shall operate the emergency voice/alarm communication system. Smoke detectors shall be located as follows:

1. In each mechanical equipment, electrical, transformer, telephone equipment or similar room.
2. In each elevator machine room and in elevator lobbies.

**907.2.13.1.2 Duct smoke detection.** Duct smoke detectors complying with Section 907.3.1 shall be located in air distribution systems in accordance with Section 606 of the *New York City Mechanical Code*.

**907.2.13.2 Fire Department communication system.** A Fire Department Auxiliary Radio Communication



System (ARCS), which shall be in accordance with Section 917, shall be required in all high-rise buildings.

**Exception:** Where it is determined by the Fire Department that a radio communication system is not required.

**907.2.13.3 Two-Way Communication System.** A two-way voice communication system (warden) phone that complies with the requirements of NFPA 72 shall be provided in the following locations and shall comply with the following requirements. Such phones shall communicate with the fire command center.

1. In Group B high-rise and large area office buildings, there shall be a minimum of two phones located on every floor accessible to all occupants, with each phone located within 5 feet (1524 mm) of a different exit stair.
2. Where elevator lobbies are permitted to be locked, the phones provided are permitted to be connected to the fire alarm system.
3. If phones are provided in areas of rescue assistance and refuge areas, the phones are permitted to be connected to the fire alarm system.
4. Where phones are provided to meet the requirements for stairway communication systems in Section 403.5.3.1, the phones are permitted to be connected to the fire alarm system.

**Exception:** Group R-2 occupancies.

**907.2.14 Atriums connecting more than two stories.** A fire alarm system shall be installed in occupancies with an atrium that connects more than two stories, with smoke detection installed throughout the atrium. The system shall be activated in accordance with Section 907.5. Such occupancies in Group A, E or M shall be provided with an emergency voice/alarm communication system complying with the requirements of Section 907.5.2.2.

**907.2.15 High-piled combustible storage areas.** An automatic fire detection system shall be installed throughout high-piled combustible storage areas where required by the *New York City Fire Code*.

**907.2.16 Aerosol storage uses.** Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an approved manual fire alarm system where required by the *New York City Fire Code*.

**907.2.17 Lumber, wood structural panel and veneer mills.** Lumber, wood structural panel and veneer mills shall be provided with a manual fire alarm system.

**907.2.18 Underground buildings with compartment smoke control system.** Where a compartment smoke control system is installed in an underground building as required by Section 405, automatic fire detectors shall be provided in accordance with Section 907.2.18.1.

**907.2.18.1 Smoke detectors.** A minimum of one smoke detector listed for the intended purpose shall be installed in the following areas:

1. Mechanical equipment, electrical, transformer, telephone equipment, elevator machine or similar rooms.

2. Elevator lobbies.

3. The main supply and return and exhaust air plenum of each air-conditioning system serving more than one story and located in a serviceable area downstream from filters on supply ducts and in return/exhaust ducts downstream of the last duct inlet.

4. Each connection to a vertical duct or riser serving two or more floors from return air ducts or plenums of heating, ventilating and air-conditioning systems, except that in Group R occupancies, a listed smoke detector is allowed to be used in each return air riser carrying not more than 5,000 cfm (2.4 m<sup>3</sup>/s) and serving not more than 10 air inlet openings.

**907.2.18.2 Alarm required.** Activation of the smoke exhaust system shall activate an audible alarm at a constantly attended location.

**907.2.19 Underground buildings.** In underground buildings complying with Section 405 where the lowest level of a structure is more than 30 feet (18 144 mm) below the lowest level of exit discharge, the structure shall be equipped throughout with a manual and automatic fire alarm system, including an emergency voice/alarm communication system installed in accordance with Section 907.5.2.2.

**907.2.20 Covered mall buildings.** Covered mall buildings exceeding 50,000 square feet (4645 m<sup>2</sup>) in total floor area shall be provided with an emergency voice/alarm communication system. An emergency voice/alarm communication system serving a mall, required or otherwise, shall be accessible to the Fire Department. The system shall be provided in accordance with Section 907.5.2.2.

**907.2.21 Battery rooms.** An approved automatic smoke detection system shall be installed in areas containing stationary storage battery systems having a liquid capacity of more than 50 gallons (189.3 L). Where the battery room is located in a building or space that is provided with a fire alarm system or subsystem, the smoke detectors shall be connected to such building fire alarm system or subsystem. The detection system shall be supervised by a central supervising station, or a local alarm that will sound an audible signal at a constantly attended location.

**907.2.22 Airport traffic control towers.** An automatic smoke detection system that activates the occupant notification system in accordance with Section 907.5 shall be provided in airport control towers in all occupiable and equipment spaces.

**Exception:** Audible appliances shall not be installed within the control tower cab.

**907.3 Fire safety functions.** Automatic fire detectors utilized for the purpose of performing fire safety functions shall be connected to the building's fire alarm control unit where a fire alarm system is required by Section 907.2. Detectors



shall, upon actuation, perform the intended function and activate the alarm notification appliances or activate a visible and audible supervisory signal at a constantly attended location.

**Exception:** In buildings not equipped with a fire alarm system, the automatic fire detector shall be powered by normal electrical service and, upon actuation, perform the intended function. The detectors shall be located in accordance with NFPA 72.

**907.3.1 Duct smoke detectors.** Smoke detectors installed in ducts shall be listed for the air velocity, temperature and humidity present in the duct. Duct smoke detectors shall be connected to the building's fire alarm control unit when a fire alarm system is required by Section 907.2. Activation of a duct smoke detector shall initiate a visible and audible supervisory signal at a constantly attended location and shall perform the intended fire safety function in accordance with this code and the *New York City Mechanical Code*. Duct smoke detectors shall not be used as a substitute for required open area detection.

**Exceptions:**

1. The supervisory signal at a constantly attended location is not required where duct smoke detectors activate the building alarm notification appliances.
2. In occupancies not required to be equipped with a fire alarm system, actuation of a smoke detector shall activate a visible and an audible signal in an approved location. Smoke detector trouble conditions shall activate a visible or audible signal in an approved location and shall be identified as air duct detector trouble.

**907.3.2 Delayed egress locks.** Where delayed egress locks are installed on means of egress doors in accordance with Section 1008.1.9.7, an automatic smoke or heat detection system shall be installed as required by that section.

**907.3.3 Elevator emergency operation.** Automatic fire detectors installed for elevator emergency operation shall be installed in accordance with the provisions of Chapter 30 of this code, ASME A17.1 and NFPA 72.

**907.3.4 Wiring.** The wiring to the auxiliary devices and equipment used to accomplish the above fire safety functions shall be monitored for integrity in accordance with NFPA 72 and the *New York City Electrical Code*.

**907.3.5 Monitoring of hold-open devices and closers.** All hold-open devices used in automatic-closing doors pursuant to the exception to Section 708.7 shall be electrically supervised to monitor the integrity of the wiring connections among the fire alarm system, the smoke detection system, and the hold-open devices.

**907.4 Initiating devices.** Where manual or automatic alarm initiation is required as part of a fire alarm system, the initiating devices shall be installed in accordance with Sections 907.4.1 through 907.4.3.

**907.4.1 Protection of fire alarm control unit.** In areas that are not continuously occupied, a single smoke detector shall be provided at the location of each fire alarm control unit, notification appliance circuit power extenders, and supervising station transmitting equipment.

**Exceptions:**

1. Where ambient conditions prohibit installation of a smoke detector, a heat detector shall be permitted.
2. In prior code buildings, where a fire alarm control unit is installed in an exit enclosure, a smoke detector is not required at the location of such fire alarm control unit.

**907.4.2 Manual fire alarm boxes.** Where a manual fire alarm system is required by another section of this code, it shall be activated by fire alarm boxes installed in accordance with Sections 907.4.2.1 through 907.4.2.5.

**907.4.2.1 Location.** Manual fire alarm boxes shall be located not more than 5 feet (1524 mm) from the entrance to each exit. Additional manual fire alarm boxes shall be located so that travel distance to the nearest box does not exceed 200 feet (60 960 mm).

**907.4.2.2 Height.** The height of the manual fire alarm boxes shall be a minimum of 42 inches (1067 mm) and a maximum of 48 inches (1219 mm), measured vertically, from the floor level to the activating handle or lever of the box.

**907.4.2.3 Color.** Manual fire alarm boxes shall be red in color.

**907.4.2.4 Signs.** Where fire alarm systems are not required to be monitored by a supervising station, an approved permanent sign that reads: WHEN ALARM SOUNDS—CALL 911 shall be installed adjacent to each manual fire alarm box.

**Exception:** Where the manufacturer has permanently provided this information on the manual fire alarm box.

**907.4.2.5 Protective covers.** The Fire Department is authorized to require the installation of listed manual fire alarm box protective covers to prevent malicious false alarms or provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless approved. Protective covers shall not project more than that permitted by Section 1003.3.3.

**907.4.3 Automatic smoke detection.** Where an automatic smoke detection system is required it shall utilize smoke detectors unless ambient conditions prohibit such an installation. In spaces where smoke detectors cannot be utilized due to ambient conditions, approved automatic heat detectors shall be permitted.

**907.4.3.1 Automatic sprinkler system.** For conditions other than specific fire safety functions noted in Section 907.3, in areas where ambient conditions prohibit the installation of smoke detectors, an automatic sprinkler system installed in such areas in accordance with Section 903.3.1.1 or 903.3.1.2 and that is connected to the fire alarm system shall be approved as automatic heat detection.

**907.4.4 Fire-extinguishing systems.** Where a fire alarm system is required by another section of this code or is otherwise installed, automatic fire-extinguishing systems installed in accordance with Section 904 shall be monitored by the fire alarm system.

**907.5 Occupant notification systems.** A fire alarm system shall annunciate at the panel and shall initiate occupant notification upon activation, in accordance with Sections 907.5.1 through 907.5.2.3.3. Where a fire alarm system is required by another section of this code, it shall be activated by:

1. Automatic fire detectors.
2. Sprinkler waterflow devices.
3. Manual fire alarm boxes.
4. Automatic fire-extinguishing systems.

**Exception:** Where notification systems are allowed elsewhere in Section 907 to annunciate at a constantly attended location or to a central supervising station.

**907.5.1 Presignal feature.** A presignal feature shall not be installed unless approved by the Fire Department. Where a presignal feature is provided, a signal shall be annunciated at a constantly attended location approved by the Fire Department, in order that occupant notification can be activated in the event of fire or other emergency.

**907.5.2 Alarm notification appliances.** Alarm notification appliances shall be provided and shall be listed for their purpose.

**907.5.2.1 Audible alarms.** Audible alarm notification appliances shall be provided and emit a distinctive sound that is not to be used for any purpose other than that of a fire alarm.

**Exception:** Visible alarm notification appliances shall be allowed in lieu of audible alarm notification appliances in critical care areas of Group I-2 occupancies.

**907.5.2.1.1 Average sound pressure.** The audible alarm notification appliances shall provide a sound pressure level of 15 decibels (dBA) above the average ambient sound level or 5 dBA above the maximum sound level having a duration of at least 60 seconds, whichever is greater, in every occupiable space within the building. The minimum sound pressure levels shall be: 75 dBA in occupancies in Groups R and I-1; 90 dBA in mechanical equipment rooms and 60 dBA in other occupancies.

**907.5.2.1.2 Maximum sound pressure.** The maximum sound pressure level for audible alarm notification appliances shall be 110 dBA at the minimum hearing distance from the audible appliance. Where the average ambient noise is greater than 95 dBA, visible alarm notification appliances shall be provided in accordance with NFPA 72 and audible alarm notification appliances shall not be required.

**907.5.2.2 Emergency voice/alarm communication systems.** Emergency voice/alarm communication systems required by this code shall be designed and installed in accordance with NFPA 72. The operation of any automatic fire detector, sprinkler waterflow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving approved information and directions for a general or staged evacuation in accordance with the building's fire safety and evacuation plans required by the *New York City Fire Code*. In high-rise buildings, the system shall operate on a minimum of the alarming floor, the floor above and the floor below. Speakers shall be provided throughout the building by paging zones. At a minimum, paging zones shall be provided as follows:

1. Each exit stairway.
2. Each floor.
3. Refuge areas as defined in Section 1002.1.

**Exceptions:**

1. **Group I-1 and I-2 occupancies.** In Group I-1 and I-2 occupancies, the alarm shall sound in a constantly attended area and a general occupant notification shall be broadcast over the overhead page.
2. **Group R-2 occupancies 125 feet or less in height.** Emergency voice/alarm communication systems shall not be required in Group R-2 occupancies in buildings 125 feet (33 100 mm) or less in height.
3. **Group R-2 occupancies greater than 125 feet in height.** In Group R-2 occupied buildings greater than 125 feet (33 100 mm) in height, activation of any smoke detector or sprinkler water flow device shall initiate a signal at a central supervising station or constantly attended location and shall not initiate a signal to an alarm notification appliance. An emergency voice/alarm communication system shall not be required. However, a one-way voice communication shall be provided between the fire command center for use by Fire Department personnel and the following terminal areas:
  - 3.1. Within dwelling units. An intercom system may be utilized when provided with an override feature for use by Fire Department

ment personnel. Such intercom system shall comply with rules promulgated by the commissioner establishing installation requirements.

- 3.2. Within required exit stairs. Annunciation devices shall be located at least on every other story. Such annunciation devices shall comply with rules promulgated by the commissioner establishing installation requirements.

**907.5.2.2.1 Manual override.** A manual override for emergency voice communication shall be provided on a selective and all-call basis for all paging zones.

**907.5.2.2.2 Live voice messages.** The emergency voice/alarm communication system shall have multi-channel capability to broadcast live voice messages by paging zones on a selective and all-call basis without automatic interruption of the alarm tones on the floor of incidence, floor above or floor below.

**907.5.2.2.3 Alternate uses.** When approved by the fire commissioner, the emergency voice/alarm communication system may be allowed to be used for other announcements.

**907.5.2.2.4 Emergency power.** Emergency voice/alarm communications systems shall be provided with an approved emergency power source in accordance with the *New York City Electrical Code*.

**907.5.2.3 Visible alarms.** Visible alarm notification appliances shall be provided in accordance with Sections 907.5.2.3.1 through 907.5.2.3.3.

**Exceptions:**

1. Visible alarm notification appliances shall not be required in exits.
2. Visible alarm notification appliances shall not be required in elevator cars.

**907.5.2.3.1 Public and common areas.** Visible alarm notification appliances shall be provided in public areas and common areas.

**907.5.2.3.2 Employee work areas.** Where employee work areas have audible alarm coverage, the notification appliance circuits serving the employee work areas shall be initially designed with a minimum of 20-percent spare capacity to account for the potential of adding visible notification appliances in the future to accommodate hearing impaired employee(s).

**907.5.2.3.3 Groups I-1 and R-1.** Group I-1 and R-1 dwelling units or sleeping units in accordance with Table 907.5.2.3.3 shall be provided with a visible alarm notification appliance, activated by both the

in-room smoke detector and the building fire alarm system.

**TABLE 907.5.2.3.3  
VISIBLE ALARMS**

NUMBER OF UNITS	UNITS WITH VISIBLE ALARMS
6 to 25	2
26 to 50	4
51 to 75	7
76 to 100	9
101 to 150	12
151 to 200	14
201 to 300	17
301 to 400	20
401 to 500	22
501 to 1,000	5% of total
1,001 and over	50 plus 3 for each 100 over 1,000

**907.6 Installation.** A fire alarm system shall be installed in accordance with this section and NFPA 72 as modified by Appendix Q.

**907.6.1 Wiring.** Wiring shall comply with the requirements of the *New York City Electrical Code* and NFPA 72 as modified by Appendix Q. Wireless protection systems utilizing radio-frequency transmitting devices shall comply with the special requirements for supervision of low-power wireless systems in NFPA 72 as modified by Appendix Q.

**907.6.2 Power supply.** The primary and secondary power supply for the fire alarm system shall be provided in accordance with the *New York City Electrical Code*.

**Exception:** Secondary power for single-station and multiple-station smoke alarms as required in Section 907.2.11.2.

**907.6.3 Zones.** For non-addressable systems, each floor shall be zoned separately and a zone shall not exceed 22,500 square feet (2090 m<sup>2</sup>). The length of any zone shall not exceed 300 feet (91 440 mm) in any direction.

**Exception:** Automatic sprinkler system zones shall not exceed the area permitted by NFPA 13.

**907.6.3.1 Zoning indicator panel.** A zoning indicator panel and the associated controls shall be provided at the main building entrance accessible to responding Fire Department personnel and in other locations approved by the department and the Fire Department. The visual zone indication shall lock in until the system is reset and shall not be canceled by the operation of an audible-alarm silencing switch.

**907.6.3.2 High-rise buildings.** In high-rise buildings constructed in accordance with Section 403, a separate zone by floor shall be provided for each of the following types of alarm-initiating devices where provided:

1. Smoke detectors.

2. Sprinkler waterflow devices.
3. Manual fire alarm boxes.
4. Other approved types of automatic fire detection devices or suppression systems.

**907.6.4 Access.** Access shall be provided to each fire alarm device and notification appliance for periodic inspection, maintenance and testing.

**907.6.5 Monitoring.** Fire alarm systems required by this chapter or by the *New York City Fire Code* shall be monitored by a central supervising station in accordance with NFPA 72 and approved by the fire commissioner.

**Exception:** Monitoring by a central supervising station is not required for:

1. Single- and multiple-station smoke alarms required by Section 907.2.11.
2. Smoke detectors in Group I-3 occupancies.
3. Automatic sprinkler systems in one- and two-family dwellings.

**907.6.5.1 Automatic telephone-dialing devices.** Automatic telephone-dialing devices used to transmit an emergency alarm shall not be connected to any Fire Department telephone number unless approved by the Fire Commissioner.

**907.7 Acceptance tests and completion.** Upon completion of the installation, the fire alarm system and all fire alarm components shall be tested in accordance with NFPA 72.

**907.7.1 Single- and multiple-station alarm devices.** When the installation of the alarm devices is complete, each device and interconnecting wiring for multiple-station alarm devices shall be tested in accordance with the smoke alarm provisions of NFPA 72.

**907.7.2 Record of completion.** A record of completion in accordance with NFPA 72 verifying that the system has been installed and tested in accordance with the approved construction documents and specifications shall be provided.

**907.7.3 Instructions.** Operating, testing and maintenance instructions, and record drawings ("as built") and equipment specifications shall be provided at an approved location.

**907.8 Inspection, testing and maintenance.** The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with the *New York City Fire Code*.

## SECTION BC 908 EMERGENCY ALARM SYSTEMS

**908.1 Group H occupancies.** Emergency alarms for the detection and notification of an emergency condition in Group H occupancies shall be provided in accordance with Section 414.7 of this code and the *New York City Fire Code*.

**908.2 Group H-5 occupancy.** Emergency alarms for notification of an emergency condition in an HPM facility shall be provided as required in Section 415.8.4.6. A continuous gas-

detection system shall be provided for HPM gases in accordance with Section 415.8.7 of this code and the *New York City Fire Code*.

**908.3 Highly toxic and toxic materials.** A gas detection system shall be provided to detect the presence of highly toxic or toxic gas at or below the permissible exposure limit (PEL) or ceiling limit of the gas for which detection is provided. The system shall be capable of monitoring the discharge from the treatment system at or below one-half the immediately dangerous to life and health (IDLH) limit and shall comply with the *New York City Fire Code*.

**Exception:** A gas detection system is not required for toxic gases when the physiological warning threshold level for the gas is at a level below the accepted PEL for the gas.

**908.3.1 Alarms.** The gas detection system shall initiate a local alarm and transmit a signal to a constantly attended control station when a short-term hazard condition is detected. The alarm shall be both visible and audible and shall provide warning both inside and outside the area where gas is detected. The audible alarm shall be distinct from all other alarms.

**Exception:** Signal transmission to a constantly attended control station is not required when not more than one cylinder of highly toxic or toxic gas is stored.

**908.3.2 Shutoff of gas supply.** The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for whichever gas is detected.

**Exception:** Automatic shutdown is not required for reactors utilized for the production of highly toxic or toxic compressed gases where such reactors are:

1. Operated at pressures less than 15 pounds per square inch gauge (psig) (103.4 kPa).
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

**908.3.3 Valve closure.** The automatic closure of shutoff valves shall be in accordance with the following:

1. When the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas room and compressed gas containers are not in gas cabinets or exhausted enclosures, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve for the compressed container of specific gas detected supplying the manifold shall automatically close.



**Exception:** When the gas-detection sampling point initiating the gas-detection system alarm is at a use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve in the gas valve enclosure for the branch line located in the piping distribution manifold enclosure shall automatically close.

**908.4 Ozone gas-generator rooms.** Ozone gas-generator rooms shall be equipped with a continuous gas-detection system that will shut off the generator and sound a local alarm when concentrations above the PEL occur and shall comply with the *New York City Fire Code*.

**908.5 Repair garages.** A flammable-gas detection system shall be provided in repair garages for vehicles fueled by enumerated gases in accordance with Section 406.6.6 and the *New York City Fire Code*.

**908.6 Refrigerant detector.** Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values for the refrigerant classification indicated in the *New York City Mechanical Code*. Detectors and alarms shall be placed in approved locations. Refrigerant detectors shall initiate all functions as required by the *New York City Mechanical Code* and *New York City Fire Code*.

**908.7 Carbon monoxide alarms and detectors.** Carbon monoxide alarms and detectors shall be provided and installed in accordance with Sections 908.7.1 through 908.7.4.

**908.7.1 Group I-1 and R occupancies.** Listed carbon monoxide alarms or detectors shall be installed as follows:

- 1. Group R-1 and Group R-2 where the main use or dominant occupancy of a building is classified as Group R-2 student apartments.** Carbon monoxide detectors and audible notification appliances shall be installed in affected dwelling units as per Section 908.7.1.1 and shall be annunciated by dwelling unit at a constantly attended location from which the fire alarm system is capable of being manually activated.
- 2. Groups I-1, R-2 (other than occupancies covered by Item 1) and R-3.** Carbon monoxide alarms shall be installed in affected dwelling units as per Section 908.7.1.1.

**908.7.1.1 Affected dwelling units.** Carbon monoxide alarms or detectors shall be required within the following dwelling units:

1. Units on the same story where carbon monoxide-producing equipment or enclosed parking is located.
2. Units on the stories immediately above and below the floor where carbon monoxide-producing equipment or enclosed parking is located.

3. Units in a building containing a carbon monoxide-producing furnace, boiler, or water heater as part of a central system.
4. Units in a building served by a carbon monoxide-producing furnace, boiler, or water heater as part of a central system that is located in an adjoining or attached building.

**908.7.1.1.1 Required locations within dwelling units.** Carbon monoxide alarms or detectors shall be located within dwelling units as follows:

1. Outside of any room used for sleeping purposes, within 15 feet (4572 mm) of the entrance to such room.
2. In any room used for sleeping purposes.
3. On any story within a dwelling unit, including below-grade stories and penthouses of any area, but not including crawl spaces and uninhabitable attics.

**908.7.1.1.2 Installation requirements.** Carbon monoxide alarms or detectors shall comply with the power source, interconnection, and acceptance testing requirements as required for smoke alarms in accordance with Sections 907.2.11.2 through 907.2.11.3.

**908.7.1.1.3 Exhaust of Carbon Monoxide in Group R-3 Occupancy (One- and Two-Family dwellings and townhouses).** Means of exhausting carbon monoxide from garages shall be provided when a carbon monoxide alarm or detector is activated in a Group R-3 occupancy, provided such garage is attached within the Group R-3 occupancy. Such exhaust system shall be arranged to operate automatically upon detection of a concentration of carbon monoxide of 35 parts per million (ppm) or greater by approved automatic detection device. The system shall be capable of producing an exhaust rate of 1.5 cfm per square foot of floor area of the garage. Removal of sensor, interruption of power or cut wires shall cause the relay circuit to open and start fan. The relay contact shall close and the fan may shut off when the carbon monoxide level is below 35 ppm. Carbon monoxide exhausting means shall be connected to a separate circuit and provided with a lock and identified at the power source. Such circuit shall not be connected to a power source through an arc-fault or Ground Fault Circuit Interrupter (GFCI) devices. Additionally, when the carbon monoxide exhausting means is connected to the plug-in-type overcurrent protection device, such device shall be secured in place by an additional fastener.

**908.7.2 Group E, I-2 and I-4 occupancies.** Listed carbon monoxide detectors with built-in sounder bases shall be transmit a signal to a central supervising station and shall be permitted to initiate an audible and visual supervisory alarm at a constantly attended location.

1. Carbon monoxide detectors with built-in sounder bases shall be installed within any room containing carbon monoxide-producing equipment.

**Exception:** Kitchens or laboratories.

2. Carbon monoxide detectors with built-in sounder bases shall be installed in all corridors on the story where enclosed parking is located, as well as one story above and one story below.
3. Carbon monoxide detectors with built-in sounder bases shall be installed in all corridors on the story where enclosed parking is located, as well as one story above and one story below.

**908.7.3 Buildings that are equipped with a fire alarm system and that contain Group A-1, A-2, A-3 or certain Group B occupancies.** Listed carbon monoxide detectors shall be installed in buildings that are equipped with a fire alarm system and that contain Group A-1, A-2 or A-3 occupancies or assembly spaces classified as Group B occupancies in accordance with Section 303.1, Exception 1. Such detectors shall have built-in sounder bases, shall transmit a signal to a central supervising station and shall be permitted to initiate an audible and visual supervisory alarm at a constantly attended location. The department shall adopt rules and/or reference standards governing the installation and location of carbon monoxide detectors provided such detectors shall be required within rooms containing carbon-monoxide producing equipment.

**Exception:** Carbon monoxide detectors shall not be required in kitchens.

**908.7.4 Installation.** Carbon monoxide alarms and detectors shall be listed in accordance with UL 2034 and UL 2075.

**908.8 Medical gas.** Medical gas pressure monitoring and alarm systems shall be provided in accordance with NFPA 99 and NFPA 99C.

**908.9 Flammable gas.** Rooms and spaces containing flammable gas distribution piping operating at levels above 15 pounds per square inch gauge (psig) (103.4 kPa) shall be provided with an approved flammable gas detection-alarm system.

## SECTION BC 909 SMOKE CONTROL SYSTEMS

**909.1 Scope and purpose.** This section applies to mechanical or passive smoke control systems when they are required by other provisions of this code. A smoke control system is a life safety system, and, where required, facilitates the evacuation of the occupants. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be

considered exhaust systems under Chapter 5 of the *New York City Mechanical Code*.

**909.1.1 Definitions.** The following words and terms shall, for the purposes of this section and as used elsewhere in this code, have the meaning shown herein.

**PRESSURIZATION.** Creation and maintenance of pressure levels in zones of a building, including elevator shafts and stairwells, that are higher than the pressure level at the smoke source, such pressure levels being produced by positive pressures of a supply of uncontaminated air; by exhausting air and smoke at the smoke source; or by a combination of these methods.

**SMOKE.** Air-borne solid and liquid particulates and gases evolved when a material undergoes pyrolysis or combustion, including the quality of air that is entrained or otherwise mixed into the mass.

**SMOKE BARRIER.** See Section 702.1.

**SMOKE CONTROL MODE.** A predefined operational configuration of a system or device for the purpose of smoke control.

**SMOKE CONTROL SYSTEM, MECHANICAL.** An engineered system that uses mechanical fans to produce pressure differences across smoke barriers or that establishes airflows to limit and direct smoke movement.

**SMOKE CONTROL SYSTEM, PASSIVE.** A system of smoke barriers arranged to limit the migration of smoke.

**SMOKE CONTROL ZONE.** A space within a building enclosed by smoke barriers.

**SMOKE DAMPER.** See Section 702.1.

**STACK EFFECT.** Vertical airflow within buildings caused by temperature differences.

**TENABLE ENVIRONMENT.** An environment in which the concentration and location of smoke is limited or otherwise restricted to allow for ready evacuation through the space.

**909.2 General design requirements.** Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The construction documents shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied by sufficient information and analysis to demonstrate compliance with these provisions.

**909.3 Special inspection and test requirements.** In addition to the ordinary inspection and test requirements that buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the construction documents shall clearly detail procedures and methods to be used and the items sub-

ject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms in Section 1704. A record of the special inspection including pressure differences, flow measurements, detection and control shall be maintained on the premises as a baseline against which future tests can be compared.

**909.3.1 Periodic testing.** Smoke control systems shall be verified weekly through the automatic control system in accordance with Section 909.12 and shall be tested annually to ensure proper operation of detection devices, dampers, fans and controls in accordance with the requirements of Sections 909.18.1, 909.18.3, 909.18.5 and 909.18.7. Full testing of smoke control systems in accordance with Sections 909.18 through 909.18.7 shall be conducted at 5-year intervals by an inspector qualified in accordance with Section 909.18.8.2. Test reports shall include all information required by Section 909.18.8.3 and shall be compared against the baseline special inspection report. Causes for any significant deviations from the baseline report shall be identified and corrected. A record of each inspection and test shall be maintained on the premises by the owner or lessee, and the records for at least the last 5 years of operation shall be made available for inspection by the department and the fire commissioner.

**909.4 Analysis.** A rational analysis supporting the types of smoke control systems to be employed, their methods of operation, the systems supporting them and the methods of construction to be utilized shall accompany the submitted construction documents and shall include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.6. The basis of design and design analysis of the smoke control system shall be submitted to the department.

**909.4.1 Stack effect.** The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

**909.4.2 Temperature effect of fire.** Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

**909.4.3 Wind effect.** The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of Chapter 16.

**909.4.4 HVAC systems.** The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the HVAC systems.

**909.4.5 Climate.** The design shall consider the effects of low temperatures on systems, property and occupants. Air

inlets and exhausts shall be located so as to prevent snow or ice blockage.

**909.4.6 Duration of operation.** All portions of active or passive smoke control systems shall be capable of continued operation after detection of the fire event for a period of not less than 20 minutes or 1.5 times the calculated egress time, whichever is more.

**909.5 Smoke barrier construction.** Smoke barriers shall comply with Section 710, and shall be constructed and sealed to limit leakage areas exclusive of protected openings. The maximum allowable leakage area shall be the aggregate area calculated using the following leakage area ratios:

1. Walls:  $A/A_w = 0.00100$
2. Exit enclosures:  $A/A_w = 0.00035$
3. All other shafts:  $A/A_w = 0.00150$
4. Floors and roofs:  $A/A_F = 0.00050$

where:

$A$  = Total leakage area, square feet ( $m^2$ ).

$A_F$  = Unit floor or roof area of barrier, square feet ( $m^2$ ).

$A_w$  = Unit wall area of barrier, square feet ( $m^2$ ).

The leakage area ratios shown do not include openings due to doors, operable windows or similar gaps. These shall be included in calculating the total leakage area.

**909.5.1 Leakage area.** The total leakage area of the barrier is the product of the smoke barrier gross area multiplied by the allowable leakage area ratio, plus the area of other openings such as gaps and operable windows. Compliance shall be determined by achieving the minimum air pressure difference across the barrier with the system in the smoke control mode for mechanical smoke control systems. Passive smoke control systems tested using other approved means such as door fan testing shall be approved by the department and the fire commissioner.

**909.5.2 Opening protection.** Openings in smoke barriers shall be protected by automatic-closing devices actuated by the required controls for the mechanical smoke control system. Door openings shall be protected by door assemblies complying with Section 715.4.3.

#### Exceptions:

1. Passive smoke control systems with automatic-closing devices actuated by spot-type smoke detectors listed for releasing service installed in accordance with Section 907.3.
2. Fixed openings between smoke zones that are protected utilizing the airflow method.
3. In Group I-2, where such doors are installed across corridors, a pair of opposite-swinging doors without a center mullion shall be installed having vision panels with approved fire-protection-rated glazing materials in approved fire-protection-rated frames, the area of which shall not exceed that tested. The doors shall be close fitting within operational tolerances and shall not have undercuts, louvers or grilles. The doors shall have head and jamb stops, astragals or rabbets at meet-



ing edges, and shall be automatic-closing by smoke detection in accordance with Section 715.4.8.3. Positive-latching devices are not required.

4. Group I-3.

5. Openings between smoke zones with clear ceiling heights of 14 feet (4267 mm) or greater and bank-down capacity of greater than 20 minutes as determined by the design fire size.

**909.5.2.1 Ducts and air transfer openings.** Ducts and air transfer openings are required to be protected with a minimum Class II, 250°F (121°C) smoke damper complying with Section 716.

**909.6 Pressurization method.** The primary mechanical means of controlling smoke shall be by pressure differences across smoke barriers. Maintenance of a tenable environment is not required in the smoke control zone of fire origin.

**909.6.1 Minimum pressure difference.** The minimum pressure difference across a smoke barrier shall be 0.05-inch water gage (0.0124 kPa) in fully sprinklered buildings. In buildings permitted to be other than fully sprinklered, the smoke control system shall be designed to achieve pressure differences at least two times the maximum calculated pressure difference produced by the design fire, but in no case less than the values indicated in Table 909.6.1:

**TABLE 909.6.1  
MINIMUM PRESSURE DIFFERENCES  
ACROSS SMOKE BARRIERS**

CEILING HEIGHT	MINIMUM DESIGN PRESSURE DIFFERENCE
Less than 15 feet (4572 mm)	0.10-inch water gage (0.0259 kPa)
Equal to or greater than 15 feet (4572 mm), but less than 21 feet (6401 mm)	0.14-inch water gage (0.0349 kPa)
Equal to or greater than 21 feet (6401 mm)	0.18-inch water gage (0.0448 kPa)

**909.6.2 Maximum pressure difference.** The maximum air pressure difference across a smoke barrier shall be determined by required door-opening or closing forces. The actual force required to open exit doors when the system is in the smoke control mode shall be in accordance with Section 1008.1.3. Opening and closing forces for other doors shall be determined by standard engineering methods for the resolution of forces and reactions. The calculated force to set aside-hinged, swinging door in motion shall be determined by:

$$F = F_{dc} + K(WA\Delta P)/2(W-d) \quad (\text{Equation 9-1})$$

where:

$A$  = Door area, square feet (m<sup>2</sup>).

$d$  = Distance from door handle to latch edge of door, feet (m).

$F$  = Total door opening force, pounds (N).

$F_{dc}$  = Force required to overcome closing device, pounds (N).

$K$  = Coefficient 5.2 (1.0).

$W$  = Door width, feet (m).

$\Delta P$  = Design pressure difference, inches of water (Pa).

**909.7 Air flow design method.** When approved by the department, smoke migration through openings fixed in a permanently open position, which are located between smoke control zones by the use of the airflow method, shall be permitted. The design air flow shall be in accordance with this section. Air flow shall be directed to limit smoke migration from the fire zone. The geometry of openings shall be considered to prevent flow reversal from turbulent effects.

**909.7.1 Velocity.** The minimum average velocity through a fixed opening shall not be less than:

$$v = 217.2 [h(T_f - T_o)/(T_f + 460)]^{1/2} \quad (\text{Equation 9-2}) \ddagger$$

$$\text{For SI: } v = 119.9 [h(T_f - T_o)/T_f]^{1/2}$$

where:

$h$  = Height of opening, feet (m).

$T_f$  = Temperature of smoke, °F (°K).

$T_o$  = Temperature of ambient air, °F (°K).

$v$  = Air velocity, feet per minute (m/minute).

**909.7.2 Prohibited conditions.** This method shall not be employed where either the quantity of air or the velocity of the airflow will adversely affect other portions of the smoke control system, unduly intensify the fire, disrupt plume dynamics or interfere with exiting. In no case shall airflow toward the fire exceed 200 feet per minute (1.02 m/s). Where the formula in Section 909.7.1 requires airflow to exceed this limit, the airflow method shall not be used.

**909.8 Exhaust method.** When approved by the department, mechanical smoke control for large enclosed volumes, such as in atriums or malls, shall be permitted to utilize the exhaust method. The design exhaust volumes shall be in accordance with NFPA 92B.

**909.8.1 Smoke layer.** The height of the lowest horizontal surface of the accumulating smoke layer shall be maintained at least 6 feet (1829 mm) above any walking surface that forms a portion of a required egress system within the smoke zone.

**909.9 Design fire.** The design fire shall be based on a  $Q$  of not less than 5,000 Btu/s (5275 kW) unless a rational analysis performed by the registered design professional and approved by the department. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

**909.9.1 Factors considered.** The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire and whether the fire is likely to be steady or unsteady.

**909.9.2 Separation distance.** Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

**909.9.3 Heat-release assumptions.** The analysis shall make use of best available data from approved sources



and shall not be based on excessively stringent limitations of combustible material.

**909.9.4 Sprinkler effectiveness assumptions.** A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

**909.10 Equipment.** Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers, shall be suitable for its intended use, suitable for the probable exposure temperatures that the rational analysis indicates, and as approved by the department.

**909.10.1 Exhaust fans.** Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

**Exception:** Reduced  $T_s$  as calculated based on the assurance of adequate dilution air.

$$T_s = (Q_c/mc) + (T_a) \quad (\text{Equation 9-3})$$

where:

$c$  = Specific heat of smoke at smoke layer temperature, Btu/lb°F (kJ/kg · K).

$m$  = Exhaust rate, pounds per second (kg/s).

$Q_c$  = Convective heat output of fire, Btu/s (kW).

$T_a$  = Ambient temperature, °F (°K).

$T_s$  = Smoke temperature, °F (°K).

**909.10.2 Ducts.** Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the *New York City Mechanical Code*. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure. Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

**Exception:** Flexible connections (for the purpose of vibration isolation) complying with the *New York City Mechanical Code*, that are constructed of approved fire-resistance-rated materials.

**909.10.3 Equipment, inlets and outlets.** Equipment shall be located so as not to expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be located so as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

**909.10.4 Automatic dampers.** Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed for their use.

**909.10.5 Fans.** In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty, but not less than two. Fans shall be selected for stable performance based on normal temperature and, where applicable, elevated temperature. Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the requirements of Chapter 16. Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts), as determined from measurement of actual current draw, and shall have a minimum service factor of 1.15.

**909.10.6 Seismic Requirements.** Smoke control systems covered by Section 909 are life safety systems and are required to function after an earthquake. Such smoke control systems shall be seismically designed in accordance with Section 1613 and ASCE 7-10. The component importance factor,  $I_p$ , shall be taken as 1.5 in accordance with ASCE 7-10, Section 13.1.3. The smoke control system includes all components required for its operation, including but not limited to fans, ducts, electrical power, switchboards, motor control centers, starters, and controls.

**Exception:** Smoke control systems in structures classified in Seismic Design Categories A or B shall have a component importance factor,  $I_p$ , of 1.0.

**909.11 Power systems.** The smoke control system shall be supplied with two sources of power. Primary power shall be from the normal building power systems. Secondary power shall be from a standby source complying with Section 2702.1.

**909.11.1 Power sources and power surges.** Elements of the smoke management system relying on volatile memories or similar systems shall be supplied with uninterruptible power sources of sufficient duration to span a 15-minute primary power interruption. Elements of the smoke management system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

**909.12 Detection and control systems.** Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control equipment.

Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, the presence of power downstream of all disconnects and, through a preprogrammed weekly test sequence report, abnormal conditions audibly, visually and by printed report.

**909.12.1 Wiring.** In addition to meeting requirements of the *New York City Electrical Code*, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

**909.12.2 Activation.** Smoke control systems shall be activated in accordance with this section.

**909.12.2.1 Pressurization, airflow or exhaust method.** Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

**909.12.2.2 Passive method.** Passive smoke control systems actuated by spot-type detectors listed for releasing service shall be permitted.

**909.12.3 Automatic control.** Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1, manual controls that are readily accessible to the Fire Department and any smoke detectors required by engineering analysis. See Section 909.16 for manual control requirements.

**909.12.3.1 Building Management System.** Automatic and manual operation of the smoke control system may alternately be done through a Building Management System (BMS) that meets the following requirements and is approved by the Fire Department:

1. The BMS system shall be listed for UL 864 UUKL Smoke Control.
2. The BMS Control Center shall be staffed 24 hours a day by operators trained in the building's smoke control systems and their operation. In buildings where Fire Safety Directors are required, they shall operate the smoke control system.
3. The control room shall be 2-hour rated construction.
4. BMS annunciation and additional control station locations shall be located in the fire command center in accordance with Section 909.16.

**909.13 Control air tubing.** Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

**909.13.1 Materials.** Control air tubing shall be hard drawn copper, Type L, ACR in accordance with ASTM B 42, ASTM B 43, ASTM B 68, ASTM B 88, ASTM B 251 and ASTM B 280. Fittings shall be wrought copper or brass, solder type, in accordance with ASME B 16.18 or ASME B 16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP5 brazing alloy with solidus above 1,100°F (593°C) and liquids below 1,500°F (816°C). Brazing flux shall be used on copper-to-brass joints only.

**Exception:** Nonmetallic tubing used within control panels and at the final connection to devices, providing all of the following conditions are met:

1. Tubing shall be listed by an approved agency for flame and smoke characteristics.
2. Tubing and connected devices shall be completely enclosed within galvanized or paint-grade steel enclosure having a minimum thickness of 0.0296 inch (0.7534 mm) (No. 22 gage). Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or teflon or by suitable brass compression to male-barbed adapter.
3. Tubing shall be identified by appropriately documented coding.
4. Tubing shall be neatly tied and supported within enclosure. Tubing bridging cabinet and door or moveable device shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

**909.13.2 Isolation from other functions.** Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an independent system.

**909.13.3 Testing.** Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

**909.14 Marking and identification.** The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

**909.15 Control diagrams.** Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the department, the Fire Department and in the fire command center in format and manner approved by the Fire Commissioner.

**909.16 Fire-fighter's smoke control panel.** A fire-fighter's smoke control panel for Fire Department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 911 in high-rise buildings or buildings with smoke-protected assembly seating. In all other buildings, the fire-fighter's smoke control panel shall be installed in the ground floor lobby of the building, adjacent to the fire alarm control panel or remote annunciator, or in another approved location. The fire-fighter's smoke control panel shall comply with Sections 909.16.1 through 909.16.3, and NFPA 72 Annex E, Fire Service Annunciator and Interface. Where required in Section 916, the post-fire smoke purge system shall be manually activated from the fire-fighter's control panel or an adjacent panel.

**909.16.1 Panel indicators.** Fans within the building shall be shown on the fire-fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by

fan and zone, and by pilot-lamp-type indicators as follows:

1. Fans, dampers and other operating equipment in their normal status—WHITE.
2. Fans, dampers and other operating equipment in their off or closed status—RED.
3. Fans, dampers and other operating equipment in their on or open status—GREEN.
4. Fans, dampers and other operating equipment in a fault status—YELLOW/AMBER.

**NYC 909.16.2 Panel controls.** The fire fighter's control panel shall provide control capability over the complete smoke-control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans and other operating equipment used or intended for smoke control purposes.
2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are also controlled from other sources within the building.
3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire-fighter's control panel. The fire-fighter's control panel shall be configured as described in Section 911.

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#### Exceptions:

1. Complex systems, where approved, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.
2. Complex systems, where approved, where the control is accomplished by computer interface using approved, plain English commands.

**909.16.3 Control action and priorities.** The fire-fighter's control panel actions shall be as follows:

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1. ON-OFF, OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire-fighter's control panel, no automatic or manual control from any other control point within the building shall contradict the control action. Where automatic means are provided to interrupt normal, nonemergency equipment operation or produce a specific result to safeguard the building or equipment (i.e., duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices), such means shall be capable of being overridden by the fire-fighter's control panel. The last control action as indicated by each fire-fighter's control panel switch position shall prevail. In no case shall control actions require the smoke control sys-

tem to assume more than one configuration at any one time.

**Exception:** Power disconnects required by the *New York City Electrical Code*. **NYC**

2. Only the AUTO position of each three-position fire-fighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire-fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described above. When directed by an automatic signal to assume an emergency condition, the NORMAL position shall become the emergency condition for that device or group of devices within the zone. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

**909.17 System response time.** Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment. For purposes of smoke control, the fire-fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed condition reported in the required final report.

**909.18 Acceptance testing.** Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

**909.18.1 Detection devices.** Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. When applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

**909.18.2 Ducts.** Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

**909.18.3 Dampers.** Dampers shall be tested for function in their installed condition.

**909.18.4 Inlets and outlets.** Inlets and outlets shall be read using generally accepted practices to determine air quantities.



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715.4 and shall be installed at the floor-side entrance to the smoke proof enclosure in accordance with Section 715.4.8. The actuation of the smoke detector on any door shall activate the closing devices on all doors in the smoke proof enclosure at all levels. Smoke detectors shall be installed in accordance with Section 907.3.

**909.20.3 Natural ventilation alternative.** The provisions of Sections 909.20.3.1 through 909.20.3.3 shall apply to ventilation of smoke proof enclosures by natural means.

**909.20.3.1 Balcony doors.** Where access to the stairway is by way of an open exterior balcony, the door assembly into the enclosure shall be a fire door assembly in accordance with Section 715.4.

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**909.20.3.2 Vestibule doors.** Where access to the stairway is by way of a vestibule, the door assembly into the vestibule shall be a fire door complying with Section 715.4. The door assembly from the vestibule to the stairway shall have not less than a 90-minute fire protection rating complying with Section 715.4.

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**909.20.3.3 Vestibule ventilation.** Each vestibule shall have a minimum net area of 16 square feet (1.5 m<sup>2</sup>) of opening in a wall facing an outer court, yard or public way that is at least 20 feet (6096 mm) in width.

**909.20.4 Mechanical ventilation alternative.** The provisions of Sections 909.20.4.1 through 909.20.4.4 shall apply to ventilation of smoke proof enclosures by mechanical means.

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**909.20.4.1 Vestibule doors.** The door assembly from the building into the vestibule shall be a fire door complying with Section 715.4.3. The door assembly from the vestibule to the stairway shall have not less than a 90-minute fire protection rating and meet the requirements for a smoke door assembly in accordance with Section 715.4.3. The door shall be installed in accordance with NFPA 105.

**909.20.4.2 Vestibule ventilation.** The vestibule shall be supplied with not less than one air change per minute and the exhaust shall not be less than 150 percent of supply. Supply air shall enter and exhaust air shall discharge from the vestibule through separate, tightly constructed ducts used only for that purpose. Supply air shall enter the vestibule within 6 inches (152 mm) of the floor level. The top of the exhaust register shall be located at the top of the smoke trap but not more than 6 inches (152 mm) down from the top of the trap, and shall be entirely within the smoke trap area. Doors in the open position shall not obstruct duct openings. Duct openings with controlling dampers are permitted where necessary to meet the design requirements, but dampers are not otherwise required.

**909.20.4.2.1 Engineered ventilation system.**

Where a specially engineered system is used, the system shall exhaust a quantity of air equal to not less than 90 air changes per hour from any vestibule in the emergency operation mode and shall be sized to handle three vestibules simultaneously. Smoke detectors shall be located at the floor-side entrance

to each vestibule and shall activate the system for the affected vestibule. Smoke detectors shall be installed in accordance with Section 907.3.

**909.20.4.3 Smoke trap.** The vestibule ceiling shall be at least 20 inches (508 mm) higher than the door opening into the vestibule to serve as a smoke and heat trap and to provide an upward-moving air column. The height shall not be decreased unless approved and justified by design and test.

**909.20.4.4 Stair shaft air movement system.** The stair shaft shall be provided with a dampered relief opening and supplied with sufficient air to maintain a minimum positive pressure of 0.10 inch of water (25 Pa) in the shaft relative to the vestibule with all doors closed. The system shall maintain a maximum of 0.35 inch of water (87 Pa) in the shaft relative to the building measured with all stairway doors closed under maximum anticipated stack pressures.

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**909.20.4.5 Door opening force.** Door opening force shall not exceed limits in Section 1008.1.3.

**909.20.5 Stair pressurization alternative.** Where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the vestibule is not required, provided that interior exit stairways are pressurized to a minimum of 0.10 inches of water (25 Pa) and a maximum of 0.35 inches of water (87 Pa) in the shaft relative to the building measured with all stairway doors closed under maximum anticipated conditions of stack effect and wind effect.

**909.20.6 Ventilating equipment.** The activation of ventilating equipment required by the alternatives in Sections 909.20.4 and 909.20.5 shall be by smoke detectors installed at each floor level at an approved location at the entrance to the smokeproof enclosure. When the closing device for the stair shaft and vestibule doors is activated by smoke detection or power failure, the mechanical equipment shall activate and operate at the required performance levels. Smoke detectors shall be installed in accordance with Section 907.3.

**909.20.6.1 Ventilation systems.** Smokeproof enclosure ventilation systems shall be independent of other building ventilation systems. The equipment, control wiring, power wiring and ductwork shall comply with one of the following:

1. Equipment, control wiring, power wiring and ductwork shall be located exterior to the building and directly connected to the smokeproof enclosure or connected to the smokeproof enclosure by ductwork enclosed by 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.
2. Equipment, control wiring, power wiring and ductwork shall be located within the smokeproof enclosure with intake or exhaust directly from and to the outside or through ductwork enclosed by 2-hour fire barriers constructed in accordance

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with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

- Equipment, control wiring, power wiring and ductwork shall be located within the building if separated from the remainder of the building, including other mechanical equipment, by 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**Exceptions:**

- Control wiring and power wiring utilizing a 2-hour rated cable or cable system in accordance with UL 2196.
- Where encased with not less than 2 inches (51 mm) of concrete.

**909.20.6.2 Standby power.** Mechanical vestibule and stair shaft ventilation systems and automatic fire detection systems shall be powered by a standby power system conforming to Section 403.4.7 and Chapter 27.

**909.20.6.3 Acceptance and testing.** Before the mechanical equipment is approved, the system shall be tested in the presence of the department or approved agency to confirm that the system is operating in compliance with these requirements.

## SECTION BC 910 SMOKE AND HEAT VENTS

**910.1 General.** Where required by this code or otherwise installed, smoke and heat vents or mechanical smoke exhaust systems and draft curtains shall conform to the requirements of this section.

**Exceptions:**

- Frozen-food warehouses used solely for storage of Class I and II commodities where protected by an automatic sprinkler system in accordance with Section 903.3.1.1.
- Where areas of buildings are equipped with early suppression fast-response (ESFR) sprinklers, automatic smoke and heat vents shall not be required within these areas.

**910.2 Where required.** Smoke and heat vents shall be installed in the roofs of buildings or portions thereof occupied for the uses set forth in Sections 910.2.1 and 910.2.2. Vents shall be installed at the top of a closed shaft in accordance with Section 708.12.1.

**910.2.1 Group F-1 or S-1.** Buildings and portions thereof used as a Group F-1 or S-1 occupancy having more than 50,000 square feet (4645 m<sup>2</sup>) in undivided area.

**Exception:** Group S-1 aircraft repair hangars.

**910.2.2 High-piled combustible storage.** Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group in accordance

with Section 413 of this code and the *New York City Fire Code*.

**910.3 Design and installation.** The design and installation of smoke and heat vents and draft curtains shall be as specified in Sections 910.3.1 and Table 910.3.

**910.3.1 Design.** Smoke and heat vents shall be listed and labeled to indicate compliance with UL 793.

**910.3.2 Vent operation.** Smoke and heat vents shall be capable of being operated by approved automatic and manual means. Automatic operation of smoke and heat vents shall conform to the provisions of Sections 910.3.2.1 through 910.3.2.3.

**910.3.2.1 Gravity-operated drop-out vents.** Automatic smoke and heat vents containing heat-sensitive glazing designed to shrink and drop out of the vent opening when exposed to fire shall fully open within 5 minutes after the vent cavity is exposed to a simulated fire, represented by a time-temperature gradient that reaches an air temperature of 500°F (260°C) within 5 minutes.

**910.3.2.2 Sprinklered buildings.** Where installed in buildings provided with an automatic sprinkler system in accordance with Section 903.3.1.1, smoke and heat vents shall be designed to operate automatically.

**910.3.2.3 Nonsprinklered buildings.** Where installed in buildings not provided with an automatic sprinkler system, smoke and heat vents shall operate automatically by actuation of a heat-responsive device rated at between 100°F (38°C) and 220°F (104°C) above ambient.

**Exception:** Gravity-operated drop-out vents complying with Section 910.3.2.1.

**910.3.3 Vent dimensions.** The effective venting area shall not be less than 16 square feet (1.5 m<sup>2</sup>) with no dimension less than 4 feet (1219 mm), excluding ribs or gutters having a total width not exceeding 6 inches (152 mm).

**910.3.4 Vent locations.** Smoke and heat vents shall be located 20 feet (6096 mm) or more from adjacent lot lines and fire walls and 10 feet (3048 mm) or more from fire barriers. Vents shall be uniformly located within the roof in the areas of the building where the vents are required to be installed by Section 910.2, with consideration given to roof pitch, draft curtain location, sprinkler location and structural members.

**910.3.5 Draft curtains.** Where required by Table 910.3, draft curtains shall be installed on the underside of the roof in accordance with this section.

**Exception:** Where areas of buildings are equipped with early suppression fast-response (ESFR) sprinklers, draft curtains shall not be provided within these areas. Draft curtains shall only be provided at the sepa-

**TABLE 910.3**  
**REQUIREMENTS FOR DRAFT CURTAINS AND SMOKE AND HEAT VENTS<sup>a</sup>**

OCCUPANCY GROUP AND COMMODITY CLASSIFICATION	DESIGNATED STORAGE HEIGHT (feet)	MINIMUM DRAFT CURTAIN DEPTH (feet)	MAXIMUM AREA FORMED BY DRAFT CURTAINS (square feet)	VENT AREA TO FLOOR AREA RATIO <sup>c</sup>	MAXIMUM SPACING OF VENT CENTERS (feet)	MAXIMUM DISTANCE FROM VENTS TO WALL OR DRAFT CURTAIN <sup>b</sup> (feet)
Group F-1	—	$0.2 \times H^d$ but $\geq 4$	50,000	1:100	120	60
High-piled (see Section 910.2.2)	$\leq 20$	6	10,000	1:100	100	60
Class I-IV commodities (Option 1)	$> 20 \leq 40$	6	8,000	1:75	100	55
High-piled Storage (see Section 910.2.2)	$\leq 20$	4	3,000	1:75	100	55
Class I-IV commodities (Option 2)	$> 20 \leq 40$	4	3,000	1:50	100	50
High-piled Storage (see Section 910.2.2)	$\leq 20$	6	6,000	1:50	100	50
High hazard commodities (Option 1)	$> 20 \leq 30$	6	6,000	1:40	90	45
High-piled Storage (see Section 910.2.2)	$\leq 20$	4	4,000	1:50	100	50
Class High hazard commodities (Option 2)	$> 20 \leq 30$	4	2,000	1:30	75	40

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

- NYC** a. Requirements for rack storage heights in excess of those indicated shall be in accordance with the *New York City Fire Code*. For solid-piled storage heights in excess of those indicated, an approved engineered design shall be used.
- b. Vents adjacent to walls or draft curtains shall be located within a horizontal distance not greater than the maximum distance specified in this column as measured perpendicular to the wall or draft curtain that forms the perimeter of the draft curtained area.
- c. Where draft curtains are not required, the vent area to floor area ratio shall be calculated based on a minimum draft curtain depth of 6 feet (Option 1).
- d. H is the height of the vent, in feet, above the floor.

**NYC** ration between the ESFR sprinklers and the conventional non-ESFR sprinklers.

**NYC** **910.3.5.1 Construction.** Draft curtains shall be constructed of sheet metal, lath and plaster, gypsum board or other approved materials that provide equivalent performance to resist the passage of smoke. Joints and connections shall be smoke tight.

**910.3.5.2 Location and depth.** The location and minimum depth of draft curtains shall be in accordance with Table 910.3.

**NYC** **910.4 Mechanical smoke exhaust.** Where approved by the department, engineered mechanical smoke exhaust shall be an acceptable alternate to smoke and heat vents.

**910.4.1 Location.** Exhaust fans shall be uniformly spaced within each draft-curtained area and the maximum distance between fans shall not be greater than 100 feet (30 480 mm).

**910.4.2 Size.** Fans shall have a maximum individual capacity of 30,000 cfm (14.2 m<sup>3</sup>/s). The aggregate capacity of smoke exhaust fans shall be determined by the equation:

$$C = A \times 300 \quad \text{(Equation 9-4)}$$

where:

$C$  = Capacity of mechanical ventilation required, in cubic feet per minute (m<sup>3</sup>/s).

$A$  = Area of roof vents provided in square feet (m<sup>2</sup>) in accordance with Table 910.3.

**910.4.3 Operation.** Mechanical smoke exhaust fans shall be automatically activated by the automatic sprinkler system or by heat detectors having operating characteristics equivalent to those described in Section 910.3.2. Individual manual controls of each fan unit shall also be provided.

**910.4.4 Wiring and control.** Wiring for operation and control of smoke exhaust fans shall be connected ahead of the main disconnect and protected against exposure to temperatures in excess of 1,000°F (538°C) for a period of not less than 15 minutes. Controls shall be located so as to be immediately accessible to the fire service from the exterior of the building and protected against interior fire exposure by not less than 1-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. The location of manual controls is subject to the approval of the Fire Commissioner.

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Department connections shall be located so that the distance between them does not exceed 300 feet (91 140 mm).

**912.2.1.5** Where a building faces upon four streets or public spaces, at least one Fire Department connection shall be provided on each street front or public space; however, only one Fire Department connection need be provided at the corner of two intersecting streets or public spaces if the Fire Department connection is located within 15 feet (4572 mm) of the corner and on the street with the longest building frontage or public space, and if the distances between Fire Department connections, in all cases, do not exceed 300 feet (91 140 mm).

**912.2.1.6** In any case where the exterior building walls of a building facing a street or public space are obstructed in part by another building, one Fire Department connection shall be provided for each clear 300 feet (91 140 mm) of exterior building wall or fraction thereof facing upon such street or public space.

**912.2.2 Existing buildings.** On existing buildings, wherever the Fire Department connection is not visible to approaching fire apparatus, the Fire Department connection shall be indicated by an approved sign mounted on the street front or on the side of the building. Such sign shall have the letters "FDC" at least 6 inches (152 mm) high and words in letters at least 2 inches (51 mm) high or an arrow to indicate the location. All such signs shall be subject to the approval of the Fire Department.

**912.3 Access.** Immediate access to Fire Department connections shall be maintained at all times and without obstruction by fences, bushes, trees, walls or any other object. A working space of not less than 36 inches (762 mm) in width, 36 inches (914 mm) in depth and 78 inches (1981 mm) in height shall be provided and maintained in front of and to the sides of wall-mounted Fire Department connections and around the circumference of free-standing Fire Department connections, except as otherwise required or approved.

**Exception:** Fences, where provided with an access gate and a means of emergency operation that shall be maintained operational at all times in accordance with the *New York City Fire Code*.

**912.4 Signs.** Fire Department connections shall be provided with signage in accordance with Section 912 of the *New York City Fire Code*.

**912.5 Backflow protection.** The potable water supply to automatic sprinkler and standpipe systems shall be protected against backflow as required by the *New York City Plumbing Code*.

## SECTION BC 913 FIRE PUMPS

**913.1 General.** Where provided or required, fire pumps shall be installed in accordance with this section, NFPA 20, Appendix Q and other applicable sections of this code.

**913.2 Protection against interruption of service.** The fire pump, driver and controller shall be protected in accordance with NFPA 20 against possible interruption of service.

**913.2.1 Protection of fire pump rooms.** Fire pumps shall be located in rooms that are separated from all other areas of the building by 2-hour fire barriers constructed in accordance with Section 707 or 2-hour horizontal assemblies constructed in accordance with Section 712, or both.

### Exceptions:

1. In other than high-rise buildings, separation by 1-hour fire barriers constructed in accordance with Section 707 or 1-hour horizontal assemblies constructed in accordance with Section 712, or both, shall be permitted in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
2. Separation is not required for fire pumps physically separated in accordance with NFPA 20.
3. Separation is not required for a fire pump, other than an automatic standpipe fire pump, where such fire pump is located in a mechanical equipment room enclosed by 2-hour fire barriers constructed in accordance with Section 707 or 2-hour horizontal assemblies constructed in accordance with Section 712, or both.

**913.3 Temperature of pump room.** Suitable means shall be provided for maintaining the temperature of a pump room or pump house, where required, above 40°F (5°C).

**913.3.1 Engine manufacturer's recommendation.** Temperature of the pump room, pump house or area where engines are installed shall never be less than the minimum recommended by the engine manufacturer. The engine manufacturer's recommendations for oil heaters shall be followed.

**913.4 Valve supervision.** Where provided, the fire pump suction, discharge and bypass valves, and isolation valves on the backflow prevention device or assembly shall be supervised open as required by Section 907.

**913.4.1 Test outlet control valve supervision.** Fire pump test outlet control valves shall be supervised in the closed position. Individual hose valves on the test header are not required to be monitored.

**913.5 Acceptance test.** Acceptance testing shall be done in accordance with the requirements of the *New York City Fire Code* and NFPA 20. Refurbished or repaired fire pumps shall be tested in accordance with the *New York City Fire Code* and NFPA 20.

## SECTION BC 914 EMERGENCY RESPONDER SAFETY FEATURES

**914.1 Shaftway markings.** Vertical shafts shall be identified as required by Sections 914.1.1 and 914.1.2.

**914.1.1 Exterior access to shaftways.** Outside openings accessible to the Fire Department and that open directly on a hoistway or shaftway communicating between two or

more floors in a building shall be plainly marked with the word "SHAFTWAY" in red letters at least 6 inches (152 mm) high on a white background. Such warning signs shall be placed so as to be readily discernible from the outside of the building.

**914.1.2 Interior access to shaftways.** Door or window openings to a hoistway or shaftway from the interior of the building shall be plainly marked with the word "SHAFTWAY" in red letters at least 6 inches (152mm) high on a white background. Such warning signs shall be placed so as to be readily discernible.

**Exception:** Markings shall not be required on shaftway openings that are readily discernible as openings onto a shaftway by the construction or arrangement.

**914.2 Equipment room identification.** Fire protection equipment shall be identified in an approved manner. Rooms containing controls for air-conditioning systems, sprinkler risers and valves or other fire detection, suppression or control elements shall be identified for the use of the Fire Department. Approved signs required to identify fire protection equipment and equipment location shall be constructed of durable materials, permanently installed and readily visible.

## SECTION BC 915 RESERVED

## SECTION 916 POST-FIRE SMOKE PURGE SYSTEMS

**916.1 Scope and purpose.** The purpose of this section is to establish minimum requirements for the design and installation of post-fire smoke purge systems, which are intended for the timely restoration of operations and overhaul activities once a fire is extinguished. Post-fire smoke purge systems are not intended or designed as life safety systems and are not required to meet the provisions of Section 909. Post-fire smoke purge systems shall be required in:

1. High-rise buildings subject to Section 403.
2. Buildings with any story exceeding 50,000 square feet (4645 m<sup>2</sup>) in floor area.
3. Building with spaces exceeding 100 feet (30 480 mm) from natural ventilation openings. Natural ventilation openings shall consist of operable windows and doors of at least 5 percent of the floor area or roof vents per Section 910.
4. High-piled stock or rack storage in accordance with the *New York City Fire Code*.

**Exceptions:** A post-fire smoke purge system is not required in R-2 occupancies where either of the following conditions exists:

1. **Openable windows.** A postfire smoke purge system is not required where every habitable room located in dwelling units is provided with windows complying with Chapter 12 and all of the following:

1.1. **Minimum window area.** Each required window shall provide at least 12 square feet (1.1 m<sup>2</sup>) of glazed area. The total area of all such windows shall not be less than 10 percent of the floor area of the room or space served.

1.2. **Minimum openable area.** Each required window shall provide a minimum of 6 square feet (0.56 m<sup>2</sup>) of openable area. The total area of all such openings shall not be less than 5 percent of the floor area of the room or space served. In addition, each required openable area shall be:

1.2.1. Located wholly at least 30 inches (762 mm) above the finished floor; and

1.2.2. Fully openable to the minimum 6 square feet (0.56 m<sup>2</sup>), at all times and without limiting stops or devices. Such openings may be achieved through the use of double-hung, sliding, or similar types of windows. However, in the event of the use of casement-, hopper-, pivot-, or awning-type windows, such windows shall satisfy the requirements of this section only when they open to at least 75 degrees (1.22 rad).

1.3 **Window guards.** This exception shall not apply where the type of window guards installed in compliance with Section 27-2043.1 of the *Administrative Code* and Section 131.15 of the *New York City Health Code* requires the installation of limiting devices or stops.

2. **Smokeproof enclosures.** A post-fire smoke purge system is not required where all exits are constructed as smokeproof enclosures in accordance with Section 1022.9.

### 916.2 Post-fire smoke purge systems in occupancy groups other than R-2.

**916.2.1 General design requirements.** Postfire smoke purge systems are permitted to use dedicated equipment, the normal building HVAC system or other openings and shall have the capability to exhaust smoke from occupied spaces. Smoke removal may be by either mechanical or natural ventilation, but shall be capable of removing cold smoke. Smoke removed from a space must be discharged to a safe location outside the building and shall not be recirculated into the building in accordance with the *New York City Mechanical Code*.

**916.2.2 Exhaust capability.** The system shall have an air supply and smoke exhaust capability that will provide a minimum of 6 air changes per hour or 1 cubic foot per minute per square foot (cfm/ft<sup>2</sup>) [0.00508 m<sup>3</sup>/s · m<sup>2</sup>], whichever is greater. The system need not exhaust from all areas at the same time, but is permitted to be zoned based on the largest fire area served. For the purpose of

calculating system size, the height of a compartment shall be considered to run from slab to slab and include the volume above suspended ceilings. Provisions shall be made for sufficient make-up air. The provisions may include operable windows, doors, building leakage, or mechanical systems. In buildings having occupied floors located less than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access, breakable windows may be utilized.

**916.2.3 Operation.** The post-fire smoke purge system shall be operated by manual controls that are part of the fire command center, in accordance with Section 911, or fire alarm control unit when a fire command center is not required. Such control center or panel shall display a graphic indicating the portions of the building served by each postfire smoke purge system. When a system is zoned into areas of operation less than the entire building, each zone shall have an individual control. Fire Department manual controls of postfire smoke purge systems shall not override the manual or automatic operation of the smoke control system. Such Fire Department manual controls shall override the fire shutdown signal from the fire alarm system.

**916.3 Post-fire smoke purge systems in occupancy Group R-2.** Post-fire smoke purge systems in R-2 occupancies shall comply with either Section 916.3.1 or 916.3.2. Smoke removed must be discharged to a safe location outside the building and shall not be recirculated into the building in accordance with the *New York City Mechanical Code*.

**916.3.1 Stair ventilation.** The top of all enclosed exit stairs shall be provided with a reversible fan system capable of introducing fresh air or exhausting air at a rate of 6 air changes per hour or 1 cubic foot per minute per square foot ( $\text{cfm/ft}^2$ ) [ $0.00508 \text{ m}^3/\text{s} \cdot \text{m}^2$ ], whichever is greater, based on the area of the largest floor. Such system shall be operated by manual controls that are part of the fire command center, as per Section 911, or fire alarm panel when a fire command center is not required. Such control center or panel shall display a graphic indicating the portions of the building served by each post-fire smoke purge system. The operation of such system shall be controlled by Fire Department personnel by manually opening stair doors at the appropriate story.

**916.3.2 Corridor ventilation.** The ducts and fans that provide fresh air supply to the public corridors in accordance with the *New York City Mechanical Code* shall be provided with reversible fans and duct sizes capable of introducing fresh air to or exhausting air from the corridor at a rate of 6 air changes per hour or 1 cubic foot per minute per square foot ( $\text{cfm/ft}^2$ ) [ $0.00508 \text{ m}^3/\text{s} \cdot \text{m}^2$ ], whichever is greater, based on the area of the largest apartment plus the area of the public corridor. Such system shall be operated by manual controls that are part of the fire command center, as per Section 911, or fire alarm panel when a fire command center is not required. Each floor to be ventilated shall be by individual controls. Such control center or panel shall display a graphic indicating the portions of the building served by each postfire smoke purge system.

**916.4 Maintenance.** The building owner shall maintain postfire smoke exhaust systems in good operational condition. Records of testing shall be maintained on the premises for inspection by the department and Fire Department personnel.

## SECTION BC 917 FIRE DEPARTMENT IN-BUILDING AUXILIARY RADIO COMMUNICATION SYSTEM (ARCS)

**917.1 General.** This section covers the design, installation and performance criteria of Fire Department In-Building Auxiliary Radio Communication System (ARCS). Where required to be installed by Sections 403, 907, or the *New York City Fire Code* or where installed voluntarily, such systems shall be designed and installed in accordance with this section, NFPA 72 as modified in Appendix Q, the *New York City Electrical Code* and as per requirements set forth by the Fire Department.

**917.1.1 Construction documents.** Construction documents for ARCS shall be submitted for review and approval to the department and the Fire Department prior to system installation. Construction documents shall include, but need not be limited to, all of the following:

1. Type of radio equipment and antenna.
2. Riser diagram and floor plans showing location of elements of the ARCS, including but not limited to building fire command center or fire alarm control panel, dedicated radio console, base station/s and all other critical system components such as antennas, amplifiers, cables as applicable.
3. Legend of all ARCS symbols and abbreviations used.
4. Location of primary and secondary power source.
5. Specification and listing details for all equipments, devices and cables.

**917.1.2 Acceptance testing, maintenance and operational testing.** Acceptance testing, maintenance and operational testing of the ARCS shall be performed in accordance with the *New York City Fire Code* and rules promulgated by the Fire Department.

**917.2 Instructions.** Operating, testing and maintenance instructions and record drawings ("as-builts") and detailed specifications of all the components shall be provided at an approved location.



## CHAPTER 10

## SECTION BC 1001 ADMINISTRATION

**1001.1 General.** Buildings or portions thereof shall be provided with a means of egress system as required by this chapter. The provisions of this chapter shall control the design, construction and arrangement of means of egress components required to provide an approved means of egress from structures and portions thereof.

**1001.2 Minimum requirements.** It shall be unlawful to alter a building or structure in a manner that will reduce the number of exits or the capacity of the means of egress to less than required by this code.

**1001.3 Maintenance.** Means of egress shall be maintained in accordance with the *New York City Fire Code*.

**1001.3.1 Workplace exits.** Except as specifically provided for in this chapter, no employer or agent of such employer shall lock the doors of or otherwise prohibit exit from any workplace, when by so doing the health or safety of any employee, independent contractor or other individual working in such workplace may become endangered by fire or other hazardous condition. Refer to Article 307 of Title 28 of the *Administrative Code*.

**1001.4 Inadequate exits for existing structures.** Every existing structure which is not provided with means of egress as required by this chapter and, in which the means of egress are, in the opinion of the commissioner, inadequate for the safety of the occupants, shall be provided with means of egress or fire protection as directed by the commissioner.

## SECTION BC 1002

### DEFINITIONS

**1002.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**ACCESSIBLE MEANS OF EGRESS.** A continuous and unobstructed way of egress travel from any accessible point in a building or facility to a public way. Such way of egress travel may include an assisted rescue path.

**AISLE.** An unenclosed exit access component that defines and provides a path of egress travel.

**AISLE ACCESSWAY.** That portion of an exit access that leads to an aisle.

**ALTERNATING TREAD DEVICE.** A device that has a series of steps between 50 and 70 degrees (0.87 and 1.22 rad) from horizontal, usually attached to a center support rail in an alternating manner so that the user does not have both feet on the same level at the same time.

**AREA OF RESCUE ASSISTANCE.** An area where persons unable to use stairways can remain temporarily to await instructions or assistance during emergency evacuation.

**ASSISTED RESCUE PATH.** A portion of the accessible means of egress which begins at the area of rescue assistance and terminates at the public way.

**BLEACHERS.** Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see “Grandstand”).

**COLLECTING SAFE AREA.** A safe area that receives occupants from the assembly space it serves, as well as from other safe areas.

**COMMON PATH OF EGRESS TRAVEL.** That portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available. Paths that merge are common paths of travel. Common paths of egress travel shall be included within the permitted travel distance.

**CORRIDOR.** An enclosed exit access component that defines and provides a path of egress travel to an exit. Corridors shall be either interior or public.

**Corridor, interior.** A corridor that serves only one tenant. In Group E occupancies, corridors serving only one institution shall be deemed as serving a single tenant.

**Corridor, public.** A corridor that serves more than one tenant.

**CROSS AISLE.** An unenclosed exit access component in a place of assembly usually parallel to rows of seats, connecting aisles or connecting an aisle and an exit. For the purposes of this chapter, a cross aisle is not an aisle.

**DEAD END.** A portion of a corridor in which the travel to an exit is in one direction only.

**DOOR, BALANCED.** A door equipped with double-pivoted hardware so designed as to cause a semicounterbalanced swing action when opening.

**EGRESS COURT.** A court or yard which provides access to a public way for one or more exits.

**EMERGENCY ESCAPE AND RESCUE OPENING.** An operable window, door or other similar device that provides for a means of escape and access for rescue in the event of an emergency.

**EXIT.** That portion of a means of egress system, which is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives as required to provide a protected path of egress travel between the exit access and the exit discharge. Exits include exterior exit doors at the level of exit discharge, vertical exit enclosures, exit passageways, exterior exit stairways, exterior exit ramps and horizontal exits, but do not include access stairs, aisles, exit access doors opening to corridors, or corridors.



**EXIT ACCESS.** That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit.

**EXIT ACCESS DOORWAY.** A door or access point along the path of egress travel from an occupied room, area or space where the path of egress enters an intervening room, corridor, unenclosed exit access stair or unenclosed exit access ramp.

**EXIT DISCHARGE.** That portion of a means of egress system between the termination of an exit and a public way.

**EXIT DISCHARGE, LEVEL OF.** The story at the point at which an exit terminates and an exit discharge begins.

**EXIT ENCLOSURE.** An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a vertical or horizontal direction to the exit discharge or the public way.

**NYC EXIT, HORIZONTAL.** An exit that provides a path of egress travel from one building to an area in another building on approximately the same level, or a path of egress travel through or around a wall or partition to an area on approximately the same level in the same building, or a bridge or tunnel between two buildings, which affords safety from fire and smoke from the area of incidence and areas communicating therewith.

**EXIT PASSAGEWAY.** An exit component that is separated from other interior spaces of a building or structure by fire-resistance-rated construction and opening protectives, and provides for a protected path of egress travel in a horizontal direction to the exit discharge or the public way.

**FIRE EXIT HARDWARE.** Panic hardware that is listed for use on fire door assemblies.

**FLIGHT.** A continuous run of rectangular treads, winders or combination thereof from one landing to another.

**NYC FLOOR AREA, GROSS.** The floor area within the inside perimeter of the exterior walls of the building under consideration, exclusive of courts, without deduction for corridors, stairways, closets, the thickness of interior walls, columns or other features. The floor area of a building, or portion thereof, not provided with surrounding exterior walls shall be the usable area under the horizontal projection of the roof or floor above. The gross floor area shall not include interior courts.

**NYC FLOOR AREA, NET.** The actual occupied area not including the thickness of walls, partitions, columns, furred-in spaces, fixed cabinets, equipment, and unoccupied accessory areas such as corridors, stairways, toilet rooms, mechanical rooms and closets.

**FOLDING AND TELESCOPIC SEATING.** Tiered seating having an overall shape and size that is capable of being reduced for purposes of moving or storing and is not a building element.

**GRANDSTAND.** Tiered seating supported on a dedicated structural system and two or more rows high and is not a building element (see “Bleachers”).

**GUARD.** A building component or a system of building components located at or near the open sides of elevated

walking surfaces that minimizes the possibility of a fall from the walking surface to a lower level.

**HANDRAIL.** A horizontal or sloping rail intended for grasping by the hand for guidance or support.

**MEANS OF EGRESS.** A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building or structure to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge.

**MERCHANDISE PAD.** A merchandise pad is an area for display of merchandise surrounded by aisles, permanent fixtures or walls. Merchandise pads contain elements such as nonfixed and moveable fixtures, cases, racks, counters and partitions from which customers browse or shop.

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**NOSING.** The leading edge of treads of stairs and of landings at the top of stairway flights.

**OCCUPANT LOAD.** The number of persons for which the means of egress of a building or portion thereof is designed.

**OPEN EXTERIOR SPACE.** A street or other public space; or a yard, court, or plaza open on one or more sides and unroofed or open on all sides, which provides egress to a street or public space.

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**PANIC HARDWARE.** A door-latching assembly incorporating a device that releases the latch upon the application of a force in the direction of egress travel.

**PHOTOLUMINESCENT.** Having the property of emitting light that continues for a length of time after excitation by visible or invisible light has been removed.

**PUBLIC WAY.** A street, alley or other parcel of land open to the outside air leading to a street, that has been deeded, dedicated or otherwise permanently appropriated to the public for public use and which has a clear width and height of not less than 10 feet (3048 mm).

**RAMP.** A walking surface that has a running slope steeper than one unit vertical in 20 units horizontal (5-percent slope).

**REFUGE AREA.** A floor area to which egress is made through a horizontal exit.

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**SAFE AREA.** An interior or exterior space that serves as a means of egress by providing a transitional area from, and that also serves as a normal means of entry to, an assembly space.

**SCISSOR STAIR.** Two interlocking stairways providing two separate paths of egress located within one stairwell enclosure.

**SEATING SECTION.** An area of seating bounded on all sides by aisles, cross aisles, walls or partitions.

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**SELF-LUMINOUS.** Illuminated by a self-contained power source, other than batteries, and operated independently of external power sources.

**SMOKE-PROTECTED ASSEMBLY SEATING.** Seating served by means of egress that is not subject to smoke accumulation within or under a structure.

**NYC STAIR.** A change in elevation, consisting of two or more risers.

**STAIRWAY.** One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another.

**Stairway, exterior.** A stairway that is open on at least one side, except for required structural columns, beams, handrails and guards. The adjoining open areas shall be either yards, courts or public ways. The other sides of the exterior stairway need not be open.

**Stairway, interior.** A stairway not meeting the definition of an exterior stairway.

**Stairway, spiral.** A stairway having a closed circular form in its plan view with uniform section-shaped treads attached to and radiating from a minimum-diameter-supporting column.

**SUITE.** A group of patient treatment rooms or patient sleeping rooms within Group I-2 occupancies where staff are in attendance within the suite, for supervision of all patients within the suite and the suite is in compliance with the requirements of Sections 1014.2.2 through 1014.2.7.

**NYC WINDER.** A stair tread with nonparallel edges.

## SECTION BC 1003 GENERAL MEANS OF EGRESS

**1003.1 Applicability.** The general requirements specified in Sections 1003 through 1013 shall apply to all three elements of the means of egress system, in addition to those specific requirements for the exit access, the exit and the exit discharge detailed elsewhere in this chapter.

**1003.2 Ceiling height.** The means of egress shall have a ceiling height of not less than 7 feet, 6 inches (2286 mm).

### Exceptions:

- NYC**
1. Ceilings that are permitted to be less than 7 feet, 6 inches (2286 mm) in accordance with Section 1208.2.
  2. Ceilings of dwelling units and sleeping units within residential occupancies in accordance with Section 1208.2.
  3. Allowable projections in accordance with Section 1003.3.
  4. Stair headroom in accordance with Section 1009.2.
  5. Door height in accordance with Section 1008.1.1.3.
  6. Ramp headroom in accordance with Section 1010.5.2.
  7. The clear height of floor levels in vehicular and pedestrian traffic areas in parking garages in accordance with Section 406.2.2.
  8. Areas above and below mezzanine floors in accordance with Section 505.1.
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**1003.3 Protruding objects.** Protruding objects shall comply with the requirements of Sections 1003.3.1 through 1003.3.4.

**1003.3.1 Headroom.** Protruding objects are permitted to extend below the minimum ceiling height required by Section 1003.2 provided a minimum headroom of 84 inches (2134 mm) shall be provided for any walking surface, including walks, corridors, aisles and passageways. Not more than 50 percent of the ceiling area of a means of egress shall be reduced in height by protruding objects.

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**Exception:** Door closers and stops shall not reduce headroom to less than 78 inches (1981 mm).

A barrier shall be provided where the vertical clearance is less than 80 inches (2032 mm) high. The leading edge of such a barrier shall be located 27 inches (686 mm) maximum above the floor.

**1003.3.2 Post-mounted objects.** A free-standing object mounted on a post or pylon shall not overhang that post or pylon more than 4 inches (102 mm) where the lowest point of the leading edge is more than 27 inches (686 mm) and less than 80 inches (2032 mm) above the walking surface. Where a sign or other obstruction is mounted between posts or pylons and the clear distance between the posts or pylons is greater than 12 inches (305 mm), the lowest edge of such sign or obstruction shall be 27 inches (686 mm) maximum or 80 inches (2032 mm) minimum above the finished floor or ground.

**Exception:** These requirements shall not apply to sloping portions of handrails between the top and bottom riser of stairs and above the ramp run.

**1003.3.3 Horizontal projections.** Structural elements, fixtures or furnishings shall not project horizontally from either side more than 4 inches (102 mm) over any walking surface between the heights of 27 inches (686 mm) and 80 inches (2032 mm) above the walking surface.

**Exception:** Handrails are permitted to protrude 4.5 inches (114 mm) from the wall.

**1003.3.4 Clear width.** Protruding objects shall not reduce the minimum clear width of accessible routes.

**1003.4 Floor surface.** Walking surfaces of the means of egress shall have a slip-resistant surface and be securely attached.

**1003.5 Elevation change.** Where changes in elevation of less than 12 inches (305 mm) exist in the means of egress, sloped surfaces shall be used. Where the slope is greater than one unit vertical in 20 units horizontal (5-percent slope), ramps complying with Section 1010 shall be used. Where the difference in elevation is 6 inches (152 mm) or less, the ramp shall be equipped with handrails or floor finish materials that contrast with adjacent floor finish materials.

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**Exceptions:** At locations that are not required to be accessible by Chapter 11:

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1. A single step with a maximum riser height of 7 inches (178 mm) is permitted for buildings with occupancies in Groups F, H, R-2, R-3, S and U at exterior doors.

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## MEANS OF EGRESS

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2. A step with a single riser or a stair with two risers and a tread is permitted provided that the risers and treads comply with Section 1009.4, the minimum depth of the tread is 13 inches (330 mm) and at least one handrail complying with Section 1012 is provided within 30 inches (762 mm) of the centerline of the normal path of egress travel on the step or stair.

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3. A step is permitted in aisles serving seating that has a difference in elevation less than 12 inches (305 mm) provided that the risers and treads comply with Section 1028 and the aisle is provided with a handrail complying with Section 1028.13.

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Throughout a story in a Group I-2 occupancy, any change in elevation in portions of the exit access that serve nonambulatory persons shall be by means of a ramp or sloped walkway.

**1003.6 Means of egress continuity.** The path of egress travel along a means of egress shall not be interrupted by any building element other than a means of egress component as specified in this chapter. Obstructions shall not be placed in the required width of a means of egress except projections permitted by this chapter. The required capacity of a means of egress system shall not be diminished along the path of egress travel.

**1003.7 Elevators, escalators and moving walks.** Elevators, escalators and moving walks shall not be used as a component of a required means of egress from any other part of the building.

### NYC Exceptions:

1. Elevators used as a component of an accessible means of egress in accordance with Section 1007.4.
2. Elevators permitted to be used for occupant self-evacuation pursuant to Sections 403.5.2 and 403.6.2.

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## SECTION BC 1004 OCCUPANT LOAD

**1004.1 Design occupant load.** In determining means of egress requirements, the number of occupants for whom means of egress facilities shall be provided shall be established by the largest number computed in accordance with Section 1004.1.1 unless otherwise permitted by Section 1004.1.2, 1004.1.3 or 1004.2. Where occupants from accessory areas egress through a primary space, the calculated occupant load for the primary space shall include the total occupant load of the primary space plus the number of occupants egressing through it from the accessory area.

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**1004.1.1 Areas without fixed seating.** The number of occupants shall be computed at the rate of one occupant per unit of area as prescribed in Table 1004.1.1. For areas without fixed seating, the occupant load shall not be less than that number determined by dividing the floor area under consideration by the occupant per unit of area factor assigned to the functions as set forth in Table 1004.1.1.

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**TABLE 1004.1.1  
MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

FUNCTION OF SPACE	FLOOR AREA IN SQ. FT. PER OCCUPANT	
Agricultural building	300 gross	
Aircraft hangars	500 gross	
Assembly		
Gaming floors (keno, slots, etc.)	11 gross	
Exhibit gallery and museums	30 net	
Assembly with fixed seats	See Section 1004.7	
Assembly without fixed seats		
Concentrated (chairs only—not fixed)	7 net	
Dance floor	5 net	
Dance floor (ballroom)	10 net	
Standing space	5 net	
Unconcentrated (tables and chairs)	15 net	
Bowling centers, allow 5 persons for each lane including 15 feet of runway, and for additional areas	7 net	
Business areas	100 gross	
Courtrooms – other than fixed seating areas	40 net	
Day Care		
Age under 6 months	50 net	
Age 6 months – 2 years	40 net	
Age 2 years – 6 years	30 net	
Age above 6 years	50 net	
Dormitories	50 gross	
Educational		
Classroom area	20 net	
Shops and other vocational room areas	50 net	
Kindergarten, and pre-kindergarten	30 net	
Exercise rooms	50 gross	
Gymnasiums	15 net	
H-5 Fabrication and manufacturing areas	200 gross	
Industrial areas	100 gross	
Institutional areas		
Inpatient treatment areas	240 gross	
Outpatient areas	100 gross	
Sleeping areas	120 gross	
Kitchens, commercial	200 gross	
Library		
Reading rooms	50 net	
Stack area	100 gross	
Locker rooms	50 gross	
Mercantile		
Areas on other floors	60 gross	
Basement and grade floor areas	30 gross	
Storage, stock, shipping areas	300 gross	
Parking garages	200 gross	
Passenger terminal		
Baggage claim	20 gross	
Baggage handling	300 gross	
Concourse	100 gross	
Passenger terminal or platform	1.5 X C*	
Waiting area (Standing)	15 gross	
Waiting areas (Seated)	5 net	
Residential	200 gross within dwelling units	

(continued)

**TABLE 1004.1.1 —continued**  
**MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANT**

FUNCTION OF SPACE	FLOOR AREA IN SQ. FT. PER OCCUPANT
Skating rinks, swimming pools	
Rink and pool	50 gross
Decks	15 gross
Stages and platforms	15 net for performing area and 50 net remaining area
Accessory storage areas, mechanical equipment room	300 gross
Warehouses	500 gross

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

**1004.1.2 Modifications.** Where the actual number of occupants of any space will be significantly lower than listed in Table 1004.1.1, the commissioner may establish a lower basis for the determination of the number of occupants.

**1004.1.3 Unlisted functions.** Where data regarding the square feet area per person for a function is not listed in Table 1004.1.1, the occupant load shall be established by a registered design professional, subject to the approval of the commissioner.

**1004.2 Increased occupant load.** The occupant load permitted in any building, or portion thereof, is permitted to be increased from that number established for the functions in Table 1004.1.1 provided that all other requirements of the code are also met based on such modified number and the occupant load shall not exceed one occupant per 5 square feet (0.47 m<sup>2</sup>) of occupiable floor space. Where required by the commissioner, an approved aisle, seating or fixed equipment diagram substantiating any increase in occupant load shall be submitted. Where required by the commissioner, such diagram shall be posted.

**1004.3 Posting of occupant load.** Every room or space that is an assembly occupancy shall have the occupant load of the room or space posted in a conspicuous place, near the main exit or exit access doorway from the room or space. Posted signs shall be of an approved legible permanent design and shall be maintained by the owner or authorized agent. Such sign shall also comply with Section 1028.1.2.

**1004.4 Exiting from multiple levels.** Where exits serve more than one floor, only the occupant load of each floor considered individually shall be used in computing the required capacity of the exits at that floor, provided that the exit capacity shall not decrease in the direction of egress travel.

**1004.5 Egress convergence.** Where means of egress from floors above and below converge at an intermediate level, the capacity of the means of egress from the point of convergence shall not be less than the sum of the two floors.

**1004.6 Mezzanine levels.** The occupant load of a mezzanine level with egress onto a room or area below shall be added to that room or area's occupant load, and the capacity of the exits shall be designed for the total occupant load thus established.

**1004.7 Fixed seating.** For areas having fixed seats and aisles, the occupant load shall be determined by the number of fixed seats installed therein. The occupant load for areas in which fixed seating is not installed, such as waiting spaces and wheelchair spaces, shall be determined in accordance with Section 1004.1.1 and added to the number of fixed seats.

For areas having fixed seating without dividing arms, the occupant load shall not be less than the number of seats based on one person for each 18 inches (457 mm) of seating length.

The occupant load of seating booths shall be based on one person for each 24 inches (610 mm) of booth seat length measured at the backrest of the seating booth.

**1004.8 Outdoor areas.** Yards, patios, courts and similar outdoor areas accessible to and usable by the building occupants shall be provided with means of egress as required by this chapter. The occupant load of such outdoor areas shall be determined by the design professional subject to the approval of the commissioner. Where outdoor areas are to be used by persons in addition to the occupants of the building, and the path of egress travel from the outdoor areas passes through the building, means of egress requirements for the building shall be based on the sum of the occupant loads of the building plus the outdoor areas.

#### Exceptions:

1. Outdoor areas used exclusively for service of the building need only have one means of egress.
2. Both outdoor areas associated with Group R-3 and individual dwelling units of Group R-2.

**1004.9 Multiple occupancies.** Where a building contains two or more occupancies, the means of egress requirements shall apply to each portion of the building based on the occupancy of that space. Where two or more occupancies utilize portions of the same means of egress system, those egress components shall meet the more stringent requirements of all occupancies that are served.

## SECTION BC 1005 EGRESS WIDTH

**1005.1 Minimum required egress width.** The means of egress width shall not be less than that required by this section. The total width of means of egress in inches (mm) shall not be less than the total occupant load served by the means of egress multiplied by 0.3 inches (7.62 mm) per occupant for stairways and by 0.2 inches (5.08 mm) per occupant for other egress components. The width shall not be less than specified elsewhere in this code. Multiple means of egress shall be sized such that the loss of any one means of egress shall not reduce the available capacity to less than 50 percent of the required capacity. The maximum capacity required from any story of a building shall be maintained to the termination of the means of egress.

**Exception:** Means of egress complying with Section 1028.

**1005.2 Door encroachment.** Doors, when fully opened, and handrails shall not reduce the required means of egress width by more than 7 inches (178 mm). Doors in any position shall not reduce the required width by more than one-half. Other



## MEANS OF EGRESS

nonstructural projections such as trim and similar decorative features shall be permitted to project into the required width a maximum of 1½ inches (38 mm) on each side.

**Exception:** The restrictions on a door swing shall not apply to doors within individual dwelling units and sleeping units of Group R-2 and dwelling units of Group R-3.

**1005.3 Door hardware encroachment.** Surface-mounted latch release hardware shall be exempt from inclusion in the 7-inch (178 mm) maximum projection requirement of Section 1005.2 when:

1. The hardware is mounted to the side of the door facing the corridor width when the door is in the open position; and
2. The hardware is mounted not less than 34 inches (865 mm) or more than 48 inches (1220 mm) above the finished floor.

### SECTION BC 1006 MEANS OF EGRESS ILLUMINATION

**1006.1 Illumination required.** Exits, exit discharges and public corridors shall be illuminated at all times by either daylight or electric lighting fixtures. Exit access components shall be illuminated by either daylight or electric lighting fixtures at all times that the space served by the exit access component is occupied.

#### Exceptions:

1. Occupancies in Group U.
2. Aisle accessways in Group A.
3. Dwelling units and sleeping units in Groups I-1, R-1, R-2 and R-3.
4. Sleeping units of Group I occupancies.
5. Areas beyond safe dispersal area where such areas are provided, and designed in accordance with Section 1027.6, Exceptions 1 through 5.

**1006.2 Illumination level.** The means of egress illumination level shall not be less than 1 foot-candle (11 lux) at the walking surface.

#### Exceptions:

1. For auditoriums, theaters, concert or opera halls and similar assembly occupancies, the illumination at the walking surface is permitted to be reduced during performances to not less than 0.5 foot-candle (5.38 lux) for aisles and cross aisles, and 0.2 foot-candle (2.15 lux) for other portions of the space, provided that the required illumination is automatically restored upon activation of a premise's fire alarm system where such system is provided. Step lights shall be provided in accordance with Section 1028.11.4.
2. Safe areas in assembly occupancies shall be illuminated in accordance with Section 1028.17.3.2.

3. Open exterior spaces used to receive occupants as Class 1 or 2 exits in assembly occupancies shall be illuminated in accordance with Section 1028.17.4.
4. In exits in buildings that contain existing photoluminescent exit path markings tested in laboratory conditions with 2 foot-candles (22 lux) of activating illumination, the illumination level shall not be less than 2 foot-candles (22 lux).

**1006.2.1 Sensors and controls.** Automatic, occupant sensor or photosensor lighting controls shall be permitted within means of egress, provided that the illumination level is not reduced to a level below the minimum requirements of Section 1006.2, and the switch controllers are equipped for fail-safe operation ensuring that if the sensor or control fails, the lighting levels will be at the levels required by Section 1006.2.

**1006.3 Illumination emergency power.** The power supply for means of egress illumination shall normally be provided by the premise's electrical supply.

In the event of power supply failure, an emergency electrical system shall automatically illuminate all of the following areas:

1. Aisles and unenclosed egress stairways in rooms and spaces that require two or more means of egress.
2. Corridors, exit enclosures and exit passageways.
3. Exterior egress components at other than their levels of exit discharge until exit discharge is accomplished for buildings required to have two or more exits.
4. Interior exit discharge elements, as permitted in Section 1027.1, in buildings required to have two or more exits.
5. Exterior landings as required by Section 1008.1.6 for exit discharge doorways in buildings required to have two or more exits.

**1006.3.1 Emergency power source.** The emergency power system shall provide power for a duration of not less than 90 minutes and shall consist of storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27.

**1006.3.2 Performance of system.** Emergency lighting facilities shall be arranged to provide initial illumination that is at least an average of 1 foot-candle (11 lux) and a minimum at any point of 0.1 foot-candle (1 lux) measured along the path of egress at floor level. Illumination levels shall be permitted to decline to 0.6 foot-candle (6.46 lux) average and a minimum at any point of 0.06 foot-candle (0.646 lux) at the end of the emergency lighting time duration. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded. In buildings that contain existing photoluminescent exit path markings tested in laboratory conditions with greater than 1 foot-candle (11 lux) of activating illumination, the initial illumination shall not be less than that required for activating the approved photoluminescent illumination.

**1006.4 Reserved.**

## SECTION BC 1007 ACCESSIBLE MEANS OF EGRESS

**1007.1 Accessible means of egress required.** Accessible means of egress shall comply with this section. Accessible spaces shall be provided with not less than one accessible means of egress. Where more than one means of egress are required by Section 1015.1 or 1021.1 from any accessible space, each accessible portion of the space shall be served by not less than two accessible means of egress.

### Exceptions:

1. Accessible means of egress are not required in alterations to prior code buildings where the level of alterations does not trigger full compliance of accessibility pursuant to Section 28-101.4 of the *Administrative Code*.
2. One accessible means of egress is required from an accessible mezzanine level in accordance with Section 1007.3, 1007.4 or 1007.5.
3. In assembly areas with sloped or stepped aisles, one accessible means of egress is permitted where the common path of travel is accessible and meets the requirements in Section 1028.8.

**1007.2 Continuity and components.** Each required accessible means of egress shall be continuous to a public way and shall consist of one or more of the following components:

1. Interior accessible routes complying with Section 1104.
2. Area of rescue assistance complying with Section 1007.6.
3. Interior exit stairways complying with Sections 1007.3 and 1022.1.
4. Exterior exit stairways complying with Sections 1007.3 and 1026.
5. Elevators complying with Section 1007.4.
6. Platform lifts complying with Section 1007.5.
7. Horizontal exits complying with Section 1025.
8. Ramps complying with Section 1010.
9. Exit discharges complying with Section 1027.
10. Exterior accessible routes complying with Section 1104.
11. Exterior areas for assisted rescue complying with Section 1007.7.

**1007.2.1 High-rise buildings.** In high-rise buildings subject to Section 403, at least one required accessible means of egress shall be an elevator complying with Section 1007.4.

### Exceptions:

1. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a

horizontal exit and located at or above the level of exit discharge.

2. In buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2, the elevator shall not be required on floors provided with a ramp conforming to the provisions of Section 1010.

3. In buildings of occupancy Group R-2 not subject to the requirements of emergency power in Section 403 of this code.

**1007.2.2 Exit discharge.** Where an exit discharge is not accessible, an exterior area for assisted rescue shall be provided in accordance with Section 1007.7. An exterior area for assisted rescue shall not be required where an exit discharge is on an assisted rescue path from a stairway or an elevator.

**1007.2.3 Exterior exit stairway.** Where an exit stairway is open to the exterior, the accessible means of egress shall include either an area of rescue assistance in accordance with Section 1007.6 or an exterior area for assisted rescue in accordance with Section 1007.7.

**1007.3 Exit stairways.** To be considered part of an accessible means of egress, an exit access stairway as permitted by Section 1016.1 or exit stairway shall have a clear width of 48 inches (1219 mm) minimum between handrails and shall either incorporate an area of rescue assistance within an enlarged floor-level landing or shall be accessed from either an area of rescue assistance complying with Section 1007.6 or a horizontal exit.

Unenclosed exit stairways as permitted by Section 1022.1 are permitted to be considered part of an accessible means of egress.

**Exceptions:** The following exceptions apply to the requirements of clear width and area of rescue assistance, and do not supersede the other requirements of the accessible means of egress:

1. The area of rescue assistance is not required for open exit access or exit stairways as permitted by Sections 1016.1 and 1022.1 in buildings that are equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
2. The clear width of 48 inches (1219 mm) between handrails and the area of rescue assistance is not required at exit access stairways as permitted by Section 1016.1 or exit stairways in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
3. Areas of rescue assistance are not required at exit stairways in buildings equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.

## MEANS OF EGRESS

- NYC 4. The clear width of 48 inches (1219 mm) between handrails is not required for enclosed exit stairways accessed from a horizontal exit.
- NYC 5. Areas of rescue assistance are not required at exit stairways serving open parking garages.
- NYC 6. Areas of rescue assistance are not required for smoke protected seating areas complying with Section 1028.6.2.
- NYC 7. The areas of rescue assistance are not required in Group R-2 occupancies.
- NYC **1007.4 Elevators.** To be considered part of an accessible means of egress, an elevator shall comply with the emergency operation and signaling device requirements of Section 2.27 of ASME A17.1 and Section 1109.6. Standby power shall be provided in accordance with Chapter 27 and Section 3003. The elevator shall be accessed from either an area of rescue assistance complying with Section 1007.6 or a horizontal exit complying with Section 1025.

### Exceptions:

- NYC 1. Elevators are not required to be accessed from an area of rescue assistance or horizontal exit in open parking garages.
- NYC 2. Elevators are not required to be accessed from an area of rescue assistance or horizontal exit in buildings and facilities equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2.
- NYC 2. Elevators not required to be located in a shaft in accordance with Section 708.2 are not required to be accessed from an area of rescue assistance or horizontal exit.
- NYC 4. Elevators are not required to be accessed from an area of rescue assistance or horizontal exit for smoke protected seating areas complying with Section 1028.6.2.

NYC **1007.5 Platform lifts.** Platform (wheelchair) lifts shall not serve as part of an accessible means of egress, except where allowed as part of a required accessible route in Section 1109.7. Platform lifts shall be installed in accordance with ASME A18.1. Standby power shall be provided in accordance with Chapter 27 for platform lifts permitted to serve as part of an accessible means of egress.

NYC **1007.5.1 Openness.** Platform lifts on an accessible means of egress shall not be installed in a fully enclosed hoistway.

NYC **1007.6 Areas of rescue assistance.** Every required area of rescue assistance shall be accessible from the space it serves by one or more accessible means of egress components as listed in Section 1007.2. The maximum travel distance from any accessible space to an area of rescue assistance shall not exceed the travel distance permitted for the occupancy in accordance with Section 1016.1. Every required area of rescue assistance shall have direct access to a stairway within an exit enclosure complying with Sections 1007.3 and 1022 or an elevator complying with Section 1007.4. Where an elevator lobby is used as an area of rescue assistance, the shaft

and lobby shall comply with Section 1022.9 for smokeproof enclosures except where the elevators are in an area of rescue assistance, such lobby shall be part of a horizontal exit or protected by a smoke barrier.

### Exceptions:

1. A stairway serving an area of rescue assistance is not required to be enclosed where permitted in Sections 1016.1 and 1022.1.
2. Smokeproof enclosure is not required for an elevator lobby used as an area of rescue assistance where the elevator is not required to be enclosed.

**1007.6.1 Size.** Each area of rescue assistance shall be sized to accommodate one wheelchair space of 30 inches by 48 inches (762 mm by 1219 mm) for each 200 occupants or portion thereof, based on the occupant load of the area of rescue assistance and areas served by the area of rescue assistance. Such wheelchair spaces shall not reduce the required means of egress width. Access to any of the required wheelchair spaces in an area of rescue assistance shall not be obstructed by more than one adjoining wheelchair space.

**1007.6.2 Separation.** Each area of rescue assistance shall be separated from the remainder of the story by a smoke barrier complying with Section 710 or a horizontal exit complying with Section 1025. Each area of rescue assistance shall be designed to minimize the intrusion of smoke.

**Exception:** Areas of rescue assistance located within an exit enclosure.

**1007.6.3 Two-way communication.** Areas of rescue assistance shall be provided with a two-way communication system complying with Sections 1007.8.1 and 1007.8.2.

**1007.7 Exterior area for assisted rescue.** The exterior area for assisted rescue must be open to the outside air and meet the requirements of Section 1007.6.1. Separation walls shall comply with the requirements of Section 705 for exterior walls. Where walls or openings are between the area for assisted rescue and the interior of the building, the building exterior walls within 10 feet (3048 mm) horizontally of a nonrated wall or unprotected opening shall have a fire-resistance rating of not less than 1 hour. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than  $\frac{3}{4}$  hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the floor level of the area for assisted rescue or to the roof line, whichever is lower.

**1007.7.1 Openness.** The exterior area for assisted rescue shall be at least 50 percent open, and the open area above the guards shall be so distributed as to minimize the accumulation of smoke or toxic gases.

**1007.7.2 Exterior exit stairway.** Exterior exit stairways that are part of the accessible means of egress for the exterior area for assisted rescue shall provide a clear width of 48 inches (1219 mm) between handrails.

**1007.8 Two-way communication.** A two-way communication system shall be provided at the elevator landing on each accessible floor that is one or more stories above or below the story of exit discharge complying with Sections 1007.8.1 and 1007.8.2.

**Exceptions:**

1. Two-way communication systems are not required at the elevator landing where the two-way communication system is provided within areas of rescue assistance in accordance with Section 1007.6.3.
2. Two-way communication systems are not required on floors provided with exit ramps conforming to the provisions of Section 1010.

**1007.8.1 System requirements.** Two-way communication systems shall provide communication between each required location and the fire command center or a central control point location approved by the Fire Department. Where the central control point is not constantly attended, a two-way communication system shall have a timed automatic telephone dial-out capability to a monitoring location or 911. The two-way communication system shall include both audible and visible signals.

**1007.8.2 Directions.** Directions for the use of the two-way communication system, instructions for summoning assistance via the two-way communication system and written identification of the location shall be posted adjacent to the two-way communication system.

**1007.9 Signage.** Signage indicating special accessibility provisions shall be provided as shown:

1. Each door providing access to an area of rescue assistance from an adjacent floor area shall be identified by a sign stating: AREA OF RESCUE ASSISTANCE.
2. Each door providing access to an exterior area for assisted rescue shall be identified by a sign stating: EXTERIOR AREA FOR ASSISTED RESCUE.

Signage shall comply with the ICC A117.1 requirements for visual characters and include the International Symbol of Accessibility. Where exit sign illumination is required by Section 1011.2, the signs shall be illuminated. Additionally, tactile signage complying with ICC A117.1 shall be located at each door to an area of rescue assistance and exterior area for assisted rescue in accordance with Section 1011.3 of this code.

**1007.10 Directional signage.** Direction signage indicating the location of the other means of egress and which are accessible means of egress shall be provided at the following:

1. At exits serving a required accessible space but not providing an approved accessible means of egress.
2. At elevator landings.
3. Within areas of rescue assistance.

**1007.11 Instructions.** In areas of rescue assistance and exterior areas for assisted rescue, instructions on the use of the area under emergency conditions shall be posted. The instructions shall include all of the following:

1. Persons able to use the exit stairway do so as soon as possible, unless they are assisting others.
2. Information on planned availability of assistance in the use of stairs or supervised operation of elevators and how to summon such assistance.
3. Directions for use of the two-way communications system where provided.

## SECTION BC 1008 DOORS, GATES AND TURNSTILES

**1008.1 Doors.** Means of egress doors shall meet the requirements of this section. Doors serving a means of egress system shall meet the requirements of this section and Section 1020.2. Doors provided for egress purposes in numbers greater than required by this code shall meet the requirements of this section.

Means of egress doors shall be readily distinguishable from the adjacent construction and finishes such that the doors are easily recognizable as doors. Mirrors or similar reflecting materials shall not be used on means of egress doors. Means of egress doors shall not be concealed by curtains, drapes, decorations or similar materials.

**1008.1.1 Size of doors.** The minimum width and height of each door opening shall be in accordance with this section.

**1008.1.1.1 Door width.** The minimum width of each door opening shall be sufficient for the occupant load thereof and shall provide a clear width of not less than 32 inches (813 mm). Clear openings of doorways with swinging doors shall be measured between the face of the door and the stop, with the door open 90 degrees (1.57 rad). Where this section requires a minimum clear width of 32 inches (813 mm) and a door opening includes two door leaves without a mullion, one leaf shall provide a clear opening width of 32 inches (813 mm). The maximum width of a swinging door leaf shall be 48 inches (1219 mm) nominal. Means of egress doors in a Group I-2 occupancy used for the movement of beds shall provide a clear width not less than 41½ inches (1054 mm).

**Exceptions:**

1. The minimum and maximum width shall not apply to door openings that are not part of the required means of egress in Group R-2 and R-3 occupancies.
2. Door openings to resident sleeping units in Group I-3 occupancies shall have a clear width of not less than 28 inches (711 mm).
3. Door openings to storage closets less than 10 square feet (0.93 m<sup>2</sup>) in area shall not be limited by the minimum width.
4. Width of door leaves in revolving doors that comply with Section 1008.1.4.1 shall not be limited.



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5. Except for Group R-1 occupancies, the minimum widths shall not apply to interior egress doors within a dwelling unit or sleeping unit that is not required to be an Accessible unit, Type B+NYC or Type B unit.
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**1008.1.1.2 Projections into clear width.** There shall not be projections into the required clear width lower than 34 inches (864 mm) above the floor or ground. Projections into the clear opening width between 34 inches (864 mm) and 80 inches (2032 mm) above the floor or ground shall not exceed 4 inches (102 mm).

**Exception:** Door closers and door stops shall be permitted to be 78 inches (1980 mm) minimum above the floor.

NYC **1008.1.1.3 Height.** The height of doors shall not be less than 80 inches (2032 mm).

**Exceptions:**

1. Door openings within a dwelling unit or sleeping unit shall not be less than 78 inches (1981 mm) in height.
2. Exterior door openings in dwelling units and sleeping units, other than the required exit door, shall not be less than 76 inches (1930 mm) in height.

NYC **1008.1.2 Door swing.** Egress doors shall be installed in accordance with this section.

NYC **1008.1.2.1 Mounting.** Egress doors shall be of the pivoted or side-hinged swinging type.

**Exceptions:**

1. Private garages, office areas, factory and storage areas with an occupant load of 10 or less.
2. Group I-3 occupancies used as a place of detention.
3. Critical or intensive care patient rooms within suites of health care facilities.
4. Doors within or serving a single dwelling unit in Groups R-2 and R-3.
5. In other than Group H occupancies, revolving doors complying with Section 1008.1.4.1.
6. In other than Group H occupancies, horizontal sliding doors complying with Section 1008.1.4.3 are permitted in a means of egress.
7. Power-operated doors in accordance with Section 1008.1.4.2.
8. Doors serving a bathroom within an individual sleeping unit in Group R-1.
9. In other than Group H occupancies, manually operated horizontal sliding doors are permitted in a means of egress from spaces with an occupant load of 10 or less.

NYC **1008.1.2.2 Direction of swing.** Doors shall swing in the direction of egress travel where serving:

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1. Group F or H occupancies.

2. Rooms or spaces with an occupant load of 50 or more persons.
  3. Rooms or spaces requiring more than one exit door.
  4. Automatic teller machines in accordance with Section 10-160 of the *Administrative Code*.
- Exception:** Doors need not swing in the direction of egress travel for exterior street floor exit doors from lobbies serving only Group R-2 or R-3 occupancies.
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**1008.1.3 Door opening force.** The force for pushing or pulling open interior swinging egress doors, other than fire doors, shall not exceed 5 pounds $\frac{1}{2}$  (22 N). For other swinging doors, as well as sliding and folding doors, the door latch shall release when subjected to a 15-pound (67 N) force. The door shall be set in motion when subjected to a 30-pound (133 N) force. The door shall swing to a full-open position when subjected to a 15-pound (67 N) force. Forces shall be applied to the latch side of the door. NYC

**1008.1.4 Special doors.** Special doors and security grilles shall comply with the requirements of Sections 1008.1.4.1 through 1008.1.4.5.

**1008.1.4.1 Revolving doors.** Revolving doors shall comply with the following:

1. Each revolving door shall be capable of collapsing into a book fold position with parallel egress paths providing an aggregate width of 36 inches (914 mm).
2. A revolving door shall not be located within 10 feet (3048 mm) of the foot of or top of stairs or escalators. A dispersal area shall be provided between the stairs or escalators and the revolving doors.
3. The revolutions per minute (rpm) for a revolving door shall not exceed those shown in Table 1008.1.4.1.
4. Each revolving door shall have a side-hinged swinging door which complies with Section 1008.1 in the same wall and within 10 feet (3048 mm) of the revolving door.
5. Revolving doors shall not be part of an accessible route required by Section 1007 and Chapter 11.

**TABLE 1008.1.4.1  
REVOLVING DOOR SPEEDS**

INSIDE DIAMETER (feet-inches)	POWER-DRIVEN-TYPE SPEED CONTROL (rpm)	MANUAL-TYPE SPEED CONTROL (rpm)
6-6	11	12
7-0	10	11
7-6	9	11
8-0	9	10
8-6	8	9
9-0	8	9
9-6	7	8
10-0	7	8

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**1008.1.4.1.1 Egress component.** A revolving door used as a component of a means of egress shall comply with Section 1008.1.4.1 and the following three conditions:

1. Revolving doors shall not be given credit for more than 50 percent of the required egress capacity.
2. Each revolving door shall be credited with no more than a 50-person capacity.
3. Each revolving door shall be capable of being collapsed when a force of not more than 130 pounds (578 N) is applied within 3 inches (76 mm) of the outer edge of a wing.

**1008.1.4.1.2 Other than egress component.** A revolving door used as other than a component of a means of egress shall comply with Section 1008.1.4.1. The collapsing force of a revolving door not used as a component of a means of egress shall not be more than 180 pounds (801 N).

**Exception:** A collapsing force in excess of 180 pounds (801 N) is permitted if the collapsing force is reduced to not more than 130 pounds (578 N) when at least one of the following conditions is satisfied:

1. There is a power failure or power is removed to the device holding the door wings in position.
2. There is an actuation of the automatic sprinkler system where such system is provided.
3. There is an actuation of a smoke detection system which is installed in accordance with Section 907 to provide coverage in areas within the building which are within 75 feet (22 860 mm) of the revolving doors.
4. There is an actuation of a manual control switch, in an approved location and clearly defined, which reduces the holding force to below the 130-pound (578 N) force level.

**1008.1.4.2 Power-operated doors.** Where means of egress doors are operated by power, such as doors with a photoelectric-actuated mechanism to open the door upon the approach of a person, or doors with power-assisted manual operation, the design shall be such that in the event of power failure, the door is capable of being opened manually to permit means of egress travel or closed where necessary to safeguard means of egress. The forces required to open these doors manually shall not exceed those specified in Section 1008.1.3, except that the force to set the door in motion shall not exceed 50 pounds (220 N). The door shall be capable of swinging from any position to the full width of the opening in which such door is installed when a force is applied to the door on the side from which egress is made. Full-power-operated doors shall comply with BHMA A156.10. Power-assisted

and low-energy doors shall comply with BHMA A156.19.

**Exceptions:**

1. Occupancies in Group I-3.
2. Horizontal sliding doors complying with Section 1008.1.4.3.
3. For a biparting door in the emergency break-out mode, a door leaf located within a multiple-leaf opening shall be exempt from the minimum 32-inch (813 mm) single-leaf requirement of Section 1008.1.1, provided a minimum 32-inch (813 mm) clear opening is provided when the two biparting leaves meeting in the center are broken out.

**1008.1.4.3 Horizontal sliding doors.** In other than Group H occupancies, horizontal sliding doors permitted to be a component of a means of egress in accordance with Exception 6 to Section 1008.1.2.1 shall comply with all of the following criteria:

1. The doors shall be power operated and shall be capable of being operated manually in the event of power failure.
2. The doors shall be openable by a simple method from both sides without special knowledge or effort.
3. The force required to operate the door shall not exceed 30 pounds (133 N) to set the door in motion and 15 pounds (67 N) to close the door or open it to the minimum required width.
4. The door shall be openable with a force not to exceed 15 pounds (67 N) when a force of 250 pounds (1100 N) is applied perpendicular to the door adjacent to the operating device.
5. The door assembly shall comply with the applicable fire protection rating and, where rated, shall be self-closing or automatic-closing by smoke detection in accordance with Section 715.4.8.3, shall be installed in accordance with NFPA 80 and shall comply with Section 715 of this code. **NYC**
6. The door assembly shall have an integrated standby power supply.
7. The door assembly power supply shall be electrically supervised.
8. The door shall open to the minimum required width within 10 seconds after activation of the operating device.

**1008.1.4.4 Access-controlled entrance doors.** The exterior building entrance doors serving occupancies in Group A, B, E, M, R-1 or R-2 and entrance doors to tenant spaces in occupancies in Groups A, B, E, M, R-1 and R-2 are permitted to be equipped with an approved entrance and egress access control system which shall be installed in accordance with all of the following criteria:

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1. A sensor shall be provided on the egress side arranged to detect an occupant approaching the doors. The doors shall be arranged to unlock by a signal from or loss of power to the sensor.
2. Loss of power to that part of the access control system which locks the doors shall automatically unlock the doors.
3. The doors shall be arranged to unlock from a manual unlocking device located 40 inches to 48 inches (1016 mm to 1219 mm) vertically above the floor and within 5 feet (1524 mm) of the secured doors. Ready access shall be provided to the manual unlocking device and the device shall be clearly identified by a sign that reads "PUSH TO EXIT." When operated, the manual unlocking device shall result in direct interruption of power to the lock—independent of the access control system electronics—and the doors shall remain unlocked for a minimum of 30 seconds.
4. Activation of the building fire alarm system, if provided, shall automatically unlock the doors, and the doors shall remain unlocked until the fire alarm system has been reset.
5. Activation of the building automatic sprinkler or fire detection system, if provided, shall automatically unlock the doors. The doors shall remain unlocked until the fire alarm system has been reset.
6. Entrance doors in buildings with an occupancy in Group A, B, E or M shall not be secured from the egress side during periods that the building is open to the general public.

**1008.1.4.5 Security grilles.** In Groups B, M and S, horizontal sliding or vertical security grilles are permitted at the main entrance where the opening of such grilles are essential to the operation of the establishments. Such grilles shall be installed in accordance with the following criteria:

1. Security grilles shall be openable from the inside without the use of a key or special knowledge or effort during periods that the space is occupied.
2. The security grilles shall remain secured in the full-open position during the period of occupancy by the general public.
3. Except as to buildings or structures classified in occupancy Group S, buildings or structures that have been designated as a landmark by the landmarks preservation commission or located in a historic district designated by such commission, on or after July 1, 2011, no security grille may be installed or replaced, nor shall the owner of a structure classified as a Group B or M occupancy or the operator of the business occupying such structure allow to be installed or replaced, a security grille to secure such property where the grille abuts the sidewalk, unless the grille, when closed,

permits visibility from the sidewalk of at least 70 percent of the area covered by such grille.

4. No later than July 1, 2026, all security grilles installed on buildings or structures classified in occupancy Groups B or M shall comply with the provisions of paragraph 3 of this section.
5. Where two or more means of egress are required, not more than one-half of the exits or exit access doorways shall be equipped with horizontal sliding or vertical security grilles.

**1008.1.5 Floor elevation.** There shall be a floor or landing on each side of a door. Such floor or landing shall be at the same elevation on each side of the door. Landings shall be level except for exterior landings, which are permitted to have a slope not to exceed 0.25 unit vertical in 12 units horizontal (2-percent slope).

**Exceptions:**

1. Doors serving individual dwelling units in Groups R-2 and R-3 where the following apply:
  - 1.1. A door is permitted to open at the top step of an interior flight of stairs within the dwelling unit, provided the door does not swing over the top step.
  - 1.2. Screen doors and storm doors are permitted to swing over stairs or landings.
2. Exterior doors as provided for in Section 1003.5, Exception 1, and Section 1020.2, which are not on an accessible route.
3. In Group R-3 occupancies not required to be Accessible units, Type B+NYC units or Type B units, the landing at an exterior doorway shall not be more than 7<sup>3</sup>/<sub>4</sub> inches (197 mm) below the top of the threshold, provided the door, other than an exterior storm or screen door, does not swing over the landing.
4. Variations in elevation due to differences in finish materials, but not more than 0.5 inch (12.7 mm).
5. Exterior spaces of Type B+NYC units and Type B units where permitted pursuant to the exception to Section 1107.4.

**1008.1.6 Landings at doors.** Landings shall have a width not less than the width of the stairway or the door, whichever is greater. Doors in the fully open position shall not reduce a required dimension by more than 7 inches (178 mm). At any stairway landing, or when a door landing serves an occupant load of 50 or more, doors in any position shall not reduce the landing to less than 75 percent of its required width. Landings shall have a length measured in the direction of travel of not less than 44 inches (1118 mm).

**Exceptions:**

1. Landing length in the direction of travel in Groups R-3 and U and within individual units of Group R-2 need not exceed 36 inches (914 mm).

2. In Group R-2 occupancies, where 36 inches wide stairways are permitted pursuant to Section 1009.1, Exception 1.2, such stairway landing length in the direction of travel shall be permitted to be not less than 36 inches (914 mm) for the width of the stairway, whichever is greater. Doors opening onto such stairway landings shall not reduce the landing width.

**1008.1.7 Thresholds.** Thresholds at doorways shall not exceed 0.75 inch (19.1 mm) in height for sliding doors serving dwelling units or 0.5 inch (12.7 mm) for other doors. Raised thresholds and floor level changes greater than 0.25 inch (6.4 mm) at doorways shall be beveled with a slope not greater than one unit vertical in two units horizontal (50-percent slope).

**Exception:** The threshold height shall be limited to 7.75 inches (197 mm) where the occupancy is Group R-2 or R-3; the door is an exterior door that is not a component of the required means of egress; the door, other than an exterior storm or screen door, does not swing over the landing or step; and the doorway is not on an accessible route as required by Chapter 11 and is not part of an Accessible unit, Type B+NYC unit or Type B unit.

**1008.1.8 Door arrangement.** Space between two doors in a series shall be 48 inches (1219 mm) minimum plus the width of a door swinging into the space. Doors in series shall swing either in the same direction or away from the space between the doors.

**Exceptions:**

1. The minimum distance between horizontal sliding power-operated doors in a series shall be 48 inches (1219 mm).
2. Storm and screen doors serving individual dwelling units in Groups R-2 and R-3 need not be spaced 48 inches (1219 mm) from the other door.
3. Doors within individual dwelling units in Group R-3.
4. Doors within individual dwelling units in Group R-2 that are not required to comply with Section 1107.
5. Exterior doors in vestibules in R-2 occupancies shall not be required to swing either in the same direction or away from the space between doors provided that the 48-inch (1219 mm) minimum space between door swings is maintained.

**1008.1.9 Door operations.** Except as specifically permitted by this section egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort.

**1008.1.9.1 Hardware.** Door handles, pulls, latches, locks and other operating devices on doors required to be accessible by Chapter 11 shall not require tight grasping, tight pinching or twisting of the wrist to operate.

**1008.1.9.2 Hardware height.** Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum above the finished floor. Locks used only for security purposes and not used for normal operation are permitted at any height.

**Exception:** Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall be permitted to have operable parts in compliance with Section 3109.4.2 or 3109.5.1.7, as applicable.

**1008.1.9.3 Locks and latches.** Locks and latches shall be permitted to prevent operation of doors where any of the following exists:

1. Places of detention or restraint.
2. Places where extra safeguards are required such as banks, museums, and jewelry stores subject to the approval of the commissioner and provided the locks are equipped with electrical release devices for remote control in case of emergencies. However, museums shall be subject to further special review by the commissioner and Fire Commissioner.
3. Main entrances in Occupancy Groups B, M, and S as permitted by Section 1008.1.3.5.
4. Doors from individual dwelling or sleeping units of Group R occupancies having an occupant load of 10 or less are permitted to be equipped with a night latch, dead bolt or security chain, provided such devices are openable from the inside without the use of a key or tool.
5. Doors serving Group R-2 occupancies as required by Section 1008.4.
6. Stairways leading from the top floor to a roof may be provided with locked wire mesh gates openable by key in Occupancy Group E. The use of a hook and eye closing device on the inside of all doors to roofs shall be permitted.
7. Fire doors after the minimum elevated temperature has disabled the unlatching mechanism in accordance with listed fire door test procedures.

**1008.1.9.4 Bolt locks.** Manually operated flush bolts or surface bolts are not permitted.

**Exceptions:**

1. On doors not required for egress in individual dwelling units or sleeping units.
2. Where a pair of doors serves a storage or equipment room, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf.
3. Where a pair of doors serves an occupant load of less than 75 persons in a Group B, F or S occupancy, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf. The inactive leaf shall contain no



doorknobs, panic bars or similar operating hardware.

4. Where a pair of doors serves a Group B, F or S occupancy, manually operated edge- or surface-mounted bolts are permitted on the inactive leaf provided such inactive leaf is not needed to meet egress width requirements and the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The inactive leaf shall contain no doorknobs, panic bars or similar operating hardware.
5. Where a pair of doors serves patient care rooms in Group I-2 occupancies, self-latching edge- or surface-mounted bolts are permitted on the inactive leaf provided that the inactive leaf is not needed to meet egress width requirements and the inactive leaf contains no doorknobs, panic bars or similar operating hardware.

**1008.1.9.5 Unlatching.** The unlatching of any door or leaf shall not require more than one operation.

**Exception:** More than one operation is permitted for unlatching doors in the following locations:

1. Places of detention or restraint.
2. Where manually operated bolt locks are permitted by Section 1008.1.9.4.
3. Doors from individual dwelling units and sleeping units of Group R occupancies as permitted by Section 1008.1.9.3, Items 4 and 5.

**1008.1.9.5.1 Closet and bathroom doors in certain Group R occupancies.** In community residences or intermediate-care facilities classified as Group R-1, R-2 or R-3 occupancies pursuant to Section 308.2.2, Exception 1, 2 or 3, within such facilities, closet doors that latch in the closed position shall be openable from inside the closet, and bathroom doors that latch in the closed position shall be capable of being unlocked from the ingress side.

**1008.1.9.6 Special locking arrangements in Group I-2.** Subject to special review and approval by the commissioner, approved, listed, delayed egress locks may be permitted on doors serving spaces in a Group I-2 occupancy where the clinical needs of persons receiving care require such locking. Delayed egress locks may be permitted in such occupancies where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or an approved automatic smoke or heat detection system installed in accordance with Section 907, provided that the doors unlock in accordance with Items 1 through 6 below. A building occupant shall not be required to pass through more than one door equipped with a delayed egress lock before entering an exit.

1. The doors unlock upon actuation of the automatic sprinkler system or automatic fire detection system.

2. The doors unlock upon loss of power controlling the lock or lock mechanism.
3. The door locks shall have the capability of being unlocked by a signal from the fire command center, a nursing station or other approved location.
4. The procedures for the operation(s) of the unlocking system shall be described and approved as part of the emergency planning and preparedness required by Chapter 4 of the *New York City Fire Code*.
5. All clinical staff shall have the keys, codes or other means necessary to operate the locking devices.
6. Emergency lighting shall be provided at the door.

**Exception:** Items 1 through 3 shall not apply to doors to areas where persons, because of clinical needs, require restraint or containment as part of the function of a mental hospital.

**1008.1.9.7 Delayed egress locks.** Subject to special review and approval by the commissioner, approved, listed, delayed egress locks may be permitted on doors serving spaces where extra safeguards are required in buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or an approved automatic smoke or heat detection system installed in accordance with Section 907, provided that the doors unlock in accordance with Items 1 through 6 below. A building occupant shall not be required to pass through more than one door equipped with a delayed egress lock before entering an exit.

1. The doors unlock upon actuation of the automatic sprinkler system or automatic fire detection system.
2. The doors unlock upon loss of power controlling the lock or lock mechanism.
3. The door locks shall have the capability of being unlocked by a signal from the fire command center.
4. The initiation of an irreversible process which will release the latch in not more than 15 seconds when a force of not more than 15 pounds (67 N) is applied for 1 second to the release device. Initiation of the irreversible process shall activate an audible signal in the vicinity of the door. Once the door lock has been released by the application of force to the releasing device, relocking shall be by manual means only. Except that where approved by the department, a delay in releasing the latch of not more than 30 seconds is permitted.
5. A sign shall be provided on the door located above and within 12 inches (305 mm) of the release device reading: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 15 SECONDS. Except that where a delay in releas-

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ing the latch of not more than 30 seconds is approved by the department, such sign shall read: PUSH UNTIL ALARM SOUNDS. DOOR CAN BE OPENED IN 30 SECONDS.

6. Emergency lighting shall be provided at the door.

**Exceptions:**

1. Delayed egress locks shall not be permitted in buildings or spaces in Group A, E, F and H occupancies. However, in museums, delayed egress locks may be installed on exit doors subject to special review by the commissioner and Fire Commissioner.
2. Places of detention or restraints in Group I-3 are permitted to install delayed egress locks without the special review by the commissioner, provided that the installation complies with all of the other requirements of this section.

**1008.1.9.8 Electromagnetically locked egress doors.**

Doors in the means of egress that are not otherwise required to have panic hardware in buildings with an occupancy in Group A, B, E, M, R-1 or R-2 and doors to tenant spaces in Group A, B, E, M, R-1 or R-2 shall be permitted to be electromagnetically locked if equipped with listed hardware that incorporates a built-in switch and meet the requirements below:

1. The listed hardware that is affixed to the door leaf has an obvious method of operation that is readily operated under all lighting conditions.
2. The listed hardware is capable of being operated with one hand.
3. Operation of the listed hardware releases to the electromagnetic lock and unlocks the door immediately.
4. Loss of power to the listed hardware automatically unlocks the door.

**1008.1.9.9 Locking arrangements in correctional facilities.** In occupancies in Groups A-2, A-3, A-4, B, E, F, I-2, I-3, M and S within correctional and detention facilities, doors in means of egress serving rooms or spaces occupied by persons whose movements are controlled for security reasons shall be permitted to be locked when equipped with egress control devices which shall unlock manually and by at least one of the following means:

1. Activation of an automatic sprinkler system installed in accordance with Section 903.3.1.1;
2. Activation of an approved manual alarm box; or
3. A signal from a constantly attended location.

**1008.1.9.10 Stairway doors.** Interior stairway means of egress doors shall be openable from both sides without the use of a key or special knowledge or effort.

**Exceptions:**

1. Stairway discharge doors shall be openable from the egress side and shall only be locked from the opposite side.
2. This section shall not apply to doors arranged in accordance with Section 403.5.3.
3. In stairways serving not more than four stories, doors are permitted to be locked from the side opposite the egress side, provided they are openable from the egress side and capable of being unlocked simultaneously without unlatching upon a signal from the fire command center, if present, or a signal by emergency personnel from a single location inside the main entrance to the building.
4. This section shall not apply to buildings permitted to be served by one exit in accordance with Item 4 or 5 of Section 1021.2.

**1008.1.10 Panic and fire exit hardware.** Doors serving a Group H occupancy and doors serving rooms or spaces with an occupant load of 50 or more in a Group A or E occupancy shall not be provided with a latch or lock unless it is panic hardware or fire exit hardware.

**Exception:** A main exit of a Group A occupancy in compliance with Section 1008.1.9.3, Item 2.

Electrical rooms with equipment rated 1,200 amperes or more and over 6 feet (1829 mm) wide that contain over-current devices, switching devices or control devices with exit or exit access doors shall be equipped with panic hardware or fire exit hardware. The doors shall swing in the direction of egress travel.

**1008.1.10.1 Installation.** Where panic or fire exit hardware is installed, it shall comply with the following:

1. Panic hardware shall be listed in accordance with UL 305;
2. Fire exit hardware shall be listed in accordance with UL 10C and UL 305;
3. The actuating portion of the releasing device shall extend at least one-half of the door leaf width; and
4. The maximum unlatching force shall not exceed 15 pounds (67 N).

**1008.1.10.2 Balanced doors.** If balanced doors are used and panic hardware is required, the panic hardware shall be the push-pad type and the pad shall not extend more than one-half the width of the door measured from the latch side.

**1008.2 Gates.** Gates serving the means of egress system shall comply with the requirements of this section. Gates used as a component in a means of egress shall conform to the applicable requirements for doors.

**Exception:** Horizontal sliding or swinging gates exceeding the 4-foot (1219 mm) maximum leaf width limitation are permitted in fences and walls surrounding a stadium.

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**1008.2.1 Stadiums.** Panic hardware is not required on gates surrounding stadiums where such gates are under constant immediate supervision while the public is present, and where safe dispersal areas based on 3 square feet (0.28 m<sup>2</sup>) per occupant are located between the fence and enclosed space. Such required safe dispersal areas shall not be located less than 50 feet (15 240 mm) from the enclosed space. See Section 1027.6 for means of egress from safe dispersal areas.

**1008.3 Turnstiles.** Turnstiles or similar devices that restrict travel to one direction shall not be placed so as to obstruct any required means of egress. Where portable turnstiles are installed for ticketing purposes, such turnstiles shall be moved from the egress path for proper exiting.

**Exceptions:**

1. **Manually-operated turnstiles.** Manually-operated turnstiles that consist of revolving devices that turn freely in the direction of exit travel may be used in any occupancy where revolving doors are permitted. Each manually-operated turnstile or similar device shall be credited with no more than a 50-person capacity where all of the following provisions are met:

- 1.1. Each device shall turn free manually in the direction of egress travel when primary power is lost, and upon the manual release by an employee in the area.
- 1.2. Such devices are not given credit for more than 50 percent of the required egress capacity.
- 1.3. Each device is not more than 39 inches (991 mm) high.
- 1.4. Each device has at least 16.5 inches (419 mm) clear width at and below a height of 39 inches (991 mm) and at least 22 inches (559 mm) clear width at heights above 39 inches (991 mm).
- 1.5. Where located as part of an accessible route, turnstiles shall have at least 36 inches (914 mm) clear at and below a height of 34 inches (864 mm), at least 32 inches (813 mm) clear width between 34 inches (864 mm) and 80 inches (2032 mm) and shall consist of a mechanism other than a revolving device.

2. **Automatic turnstiles.** Automatic turnstiles that consist of mechanisms other than revolving devices, and are operated by power, such as turnstiles with a photoelectric-actuated mechanism to open the turnstile upon the approach of a person, may be used in any occupancy where revolving doors are permitted. Automatic turnstiles may serve a means of egress system where all of the following provisions are met:

- 2.1. Each automatic turnstile shall have minimum widths sufficient for the occupant load served and shall provide at least 32 inches (813 mm) of clear width at and below a height of 80 inches (2032 mm).

2.2. The design shall be such that in the event of power failure, each automatic turnstile is capable of breaking away manually to permit means of egress travel. The force required to break away these turnstiles manually shall not exceed 13 pounds (57 N). The turnstile shall be capable of swinging from any position to the full, clear opening width of the turnstile when a force is applied to the turnstile on the side from which egress is made.

2.3. Each automatic turnstile shall be operable from the egress side without special knowledge or effort.

2.4. Each automatic turnstile shall be connected to the building fire alarm system. Activation of the building fire alarm system shall automatically release each such turnstile to its full, clear opening width, and each such turnstile shall remain in its open position until the fire alarm system has been reset.

2.5. Each automatic turnstile shall have an integrated emergency power supply.

2.6. Each automatic turnstile power supply shall be electrically supervised.

2.7. Turnstiles provided for egress purposes in numbers greater than the egress capacity required by this code shall meet the requirements of this section.

2.8. Where located as part of an accessible route, such turnstiles shall have at least 36 inches (914 mm) clear width at and below a height of 34 inches (864 mm), at least 32 inches (813 mm) clear width between 34 inches (864 mm) and 80 inches (2032 mm).

**1008.3.1 High turnstile.** Turnstiles more than 39 inches (991 mm) high shall meet the requirements for revolving doors.

**1008.3.2 Additional door.** Where serving an occupant load greater than 300, each manually-operated turnstile and automatic turnstile that is not portable shall have a side-hinged swinging door which conforms to Section 1008.1 within 50 feet (15 240 mm).

**1008.4 Security requirements for doors and windows.** The provisions of Sections 1008.4.1 through 1008.4.4 shall apply to Group R-2 occupancies.

**1008.4.1 Entrance doors.** Building entrance doors and other exterior exit doors shall be equipped with heavy duty lock sets with auxiliary latch bolts to prevent the latch from being manipulated by means other than a key. Latch sets shall have stop-work in the inside cylinder controlled by a master key only. Outside cylinders of main entrance door locks shall be operated by the tenants' key, which shall not be keyed to also open the tenants' apartment door. A light or lights shall be provided at or near the outside of the front entranceway of the building providing not less than 5-foot candles (53.82 lux) intensity

measured at the floor level for the full width of the entranceway.

**1008.4.2 Doors to dwelling units.** Doors to dwelling units shall be equipped with a heavy duty latch set and a heavy duty dead bolt operable by a key from the outside and a thumb-turn from the inside. Those doors shall also be equipped with a chain guard so as to permit partial opening of the door. Dwelling unit entrance doors shall also be equipped with a viewing device located so as to enable a person on the inside of the entrance door to view a person immediately outside.

**1008.4.3 Windows.** All openable windows shall be equipped with sash locks designed to be openable from the inside only. Grilles lockable from the inside only may be placed on the inside or outside of windows that are accessible from grade but that do not serve to provide access to exits.

**1008.4.4 Intercommunication system.** Buildings containing eight or more dwelling units shall be provided with an intercommunication system located at the door giving access to the main entrance lobby, consisting of a device or devices for voice communication between the occupant of each dwelling unit and a person outside the door to the main entrance lobby, and permitting such dwelling unit occupant to release the locking mechanism of said door from the dwelling unit. In buildings provided with a full-time lobby attendant, the intercommunication system may be between each dwelling unit and the attendant's station.

## SECTION BC 1009 STAIRWAYS

**1009.1 Stairway width.** The width of stairways shall be determined as specified in Section 1005.1, but such width shall not be less than 44 inches (1118 mm). See Section 1007.3 for accessible means of egress stairways.

### Exceptions:

1. A width of not less than 36 inches (914 mm) shall be permitted in:
  - 1.1. A stairway that serves an occupant load of 50 or less cumulative for all stories; or
  - 1.2. A stairway that provides egress to the exit discharge solely for the use of Group R-2 occupancies, provided the building it serves is 125 feet (38 100 mm) or less in height, and provided such a stairway serves not more than 30 occupants per floor.
2. Spiral stairways as provided for in Section 1009.9.
3. Aisle stairs complying with Section 1028.
4. Where an inclined platform lift or a stairway chairlift is installed on stairways serving occupancies in Group R-3, or within dwelling units in occupancies in Group R-2 a clear passage width not less than 20

inches (508 mm) shall be provided. If the seat and platform can be folded when not in use, the distance shall be measured from the folded position.

**1009.2 Headroom.** Stairways shall have a minimum headroom clearance of 84 inches (2134 mm) measured vertically from a line connecting the edge of the nosings. Such headroom shall be continuous above the stairway to the point where the line intersects the landing below, one tread depth beyond the bottom riser. The minimum clearance shall be maintained the full width of the stairway and landing. Projections into the required width shall not be limited above the minimum headroom height.

### Exceptions:

1. In Group R-2 and R-3 occupancies stairways shall have a minimum headroom clearance of 80 inches (2032 mm).
2. Spiral stairways complying with Section 1009.9 are permitted a 78-inch (1981 mm) headroom clearance.
3. In Group R-3 occupancies; within dwelling units in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual dwelling units in Group R-2 occupancies; where the nosings of treads at the side of a flight extend under the edge of a floor opening through which the stair passes, the floor opening shall be allowed to project horizontally into the required headroom a maximum of  $4\frac{3}{4}$  inches (121 mm).

**1009.3 Walkline.** The walkline across winder treads shall be concentric to the direction of travel through the turn and located 12 inches (305 mm) from the side where the winders are narrower. The 12-inch (305 mm) dimension shall be measured from the widest point of the clear stair width at the walking surface of the winder. If winders are adjacent within the flight, the point of the widest clear stair width of the adjacent winders shall be used.

**1009.4 Stair treads and risers.** Stair treads and risers shall comply with Sections 1009.4.1 through 1009.4.5.

**1009.4.1 Dimension reference surfaces.** For the purpose of this section, all dimensions are exclusive of carpets, rugs or runners.

**1009.4.2 Riser height and tread depth.** Stair riser heights shall be 7 inches (178 mm) maximum and 4 inches (102 mm) minimum. The riser height shall be measured vertically between the leading edges of adjacent treads. Rectangular tread depths shall be 11 inches (279 mm) minimum measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than  $\frac{3}{8}$  inch (9.5 mm). Winder treads shall have a minimum tread depth of 11 inches (279 mm) measured between the vertical planes of the foremost projection of adjacent treads at the intersections with the



walkline and a minimum tread depth of 10 inches (254 mm) within the clear width of the stair.

**Exceptions:**

1. Alternating tread devices in accordance with Section 1009.10.
2. ~~‡~~Ship ladders in accordance with Section 1009.11.
3. ~~‡~~Spiral stairways in accordance with Section 1009.9.
4. ~~‡~~Aisle stairs in assembly seating areas where the stair pitch or slope is set, for sightline reasons, by the slope of the adjacent seating area in accordance with Section 1028.11.2.
5. ~~‡~~In Group R-2 occupancies:
  - 5.1. ~~‡~~Sum of treads and risers. The sum of two risers plus one tread exclusive of nosing shall be not less than 24 inches (610 mm) nor more than 25½ inches (648 mm).
  - 5.2. ~~‡~~Dimensions of treads and risers. The maximum riser height shall be 7¾ inches (197 mm) and the minimum tread depth shall be 9½ inches (241 mm) plus nosing. Treads may be undercut a distance equal to the nosing. A nosing not less than ¾ inch (19 mm) but not more than 1¼ inches (32 mm) shall be provided on stairways with solid risers where the tread depth is less than 11 inches (279 mm).
  - 5.3. ~~‡~~Tolerances. The greatest riser height, tread depth, and nosing projection, within any flight of stairs shall not exceed the smallest by more than ⅜ inch (9.5 mm).
6. ~~‡~~In Group R-3 occupancies; within dwelling units in Group R-2 occupancies not subject to accessibility provisions in Section 1107.2.5, Exception 2; and in Group U occupancies that are accessory to Group R-3 occupancy or accessory to individual dwelling units in Group R-2 occupancies:
  - 6.1. ~~‡~~Sum of treads and risers. The sum of two risers plus one tread exclusive of nosing shall be not less than 24 inches (610 mm) nor more than 25½ inches (648 mm).
  - 6.2. ~~‡~~Dimensions of treads and risers. The maximum riser height shall be 8¼ inches (210 mm) and the minimum tread depth shall be 9 inches (229 mm) plus nosing. Treads may be undercut a distance equal to the nosing. A 1¼-inch (32 mm) nosing shall be provided on stairways with solid risers where the tread depth is less than 11 inches (279 mm).

6.3. ~~‡~~Tolerances. The greatest riser height, tread depth, and nosing projection, within any flight of stairs shall not exceed the smallest by more than ⅜ inch (9.5 mm).

7. ~~‡~~In Group R-3 occupancies; and within dwelling units in Group R-2 occupancies; winders shall have a minimum tread depth of 10 inches (254 mm) measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge, when measured at a point 12 inches (305 mm) from the side where the treads are narrower. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point. Within any flight of stairs, the greatest winder tread depth at the 12-inch (305 mm) walk line shall not exceed the smallest by more than ⅜ inch (9.5 mm).
8. ~~‡~~In Group I-3 facilities, stairways providing access to guard towers, observation stations and control rooms, not more than 250 square feet (23 m²) in area, shall be permitted to have a maximum riser height of 8 inches (203 mm) and a minimum tread depth of 9 inches (229 mm).

**1009.4.3 Winder treads.** Winder treads are not permitted in means of egress stairways except within a dwelling unit.

**Exceptions:**

1. Curved stairways in accordance with Section 1009.8.
2. Spiral stairways in accordance with Section 1009.9.

**1009.4.4 Dimensional uniformity.** Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed 0.375 inch (9.5 mm) in any flight of stairs. The greatest winder tread depth at the walkline within any flight of stairs shall not exceed the smallest by more than ⅜ inch (9.5 mm).

**Exceptions:**

1. Nonuniform riser dimensions of aisle stairs complying with Section 1028.11.2.
2. Consistently shaped winders, complying with Section 1009.4.2, differing from rectangular treads in the same stairway flight.
3. Where the bottom or top riser adjoins a sloping public way, walkway or driveway having an established grade and serving as a landing, the bottom or top riser is permitted to be reduced along the slope to less than 4 inches (102 mm) in height with the variation in height of the bottom or top riser not to exceed one unit vertical in 12 units horizontal (8-percent slope) of stairway width. The nosings or leading edges of treads at such nonuniform height risers shall have a distinctive marking stripe, different from any other nosing marking provided on the stair flight. The

distinctive marking stripe shall be visible in descent of the stair and shall have a slip-resistant surface. Marking stripes shall have a width of at least 1 inch (25 mm) but not more than 2 inches (51 mm).

**1009.4.5 Profile.** The radius of curvature at the leading edge of the tread shall be not greater than  $\frac{9}{16}$  inch (14.3 mm). Beveling of nosings shall not exceed  $\frac{9}{16}$  inch (14.3 mm). Risers shall be solid and vertical or sloped under the tread above from the underside of the nosing above at an angle not more than 30 degrees (0.52 rad) from the vertical. The leading edge (nosings) of treads shall project not more than  $1\frac{1}{4}$  inches (32 mm) beyond the tread below and all projections of the leading edges shall be of uniform size, including the leading edge of the floor at the top of a flight. Perforated risers with openings not exceeding  $\frac{1}{4}$  inch (6.4 mm) shall be considered solid risers.

#### Exceptions:

1. Solid risers are not required for stairways that are not serving as exits or that are not required to comply with Section 1007.3, provided that the opening between treads does not permit the passage of a sphere with a diameter of 4 inches (102 mm).
2. Solid risers are not required for occupancies in Group I-3 or in Group F, H and S occupancies other than areas accessible to the public. There are no restrictions on the size of the opening in the riser.
3. In Group R-3 occupancies, the following shall apply:
  - 3.1. The radius of curvature at the leading edge of the tread shall be no greater than  $\frac{9}{16}$  inch (14.3 mm).
  - 3.2. Solid risers are not required provided that the opening between treads does not permit the passage of a sphere with a diameter of 4 inches (102 mm). However, the opening between treads is not limited on stairways with a total rise of 30 inches (762 mm) or less.
4. Solid risers are not required for spiral stairways constructed in accordance with Section 1009.9.
5. Solid risers are not required for alternating tread devices constructed in accordance with Section 1009.10.

**1009.5 Stairway landings.** There shall be a floor or landing at the top and bottom of each stairway. The width of landings shall not be less than the width of stairways they serve. Every landing shall have a minimum dimension measured in the direction of travel equal to the width of the stairway. Such dimension need not exceed 48 inches (1219 mm) where the stairway has a straight run. When wheelchair spaces are required on the stairway landing in accordance with Section 1007.6.1, the wheelchair space shall not be located in the required width of the landing and doors shall

not swing over the wheelchair spaces. Where doors open onto a stairway landing, such landing shall also comply with Section 1008.1.6.

**Exception:** Aisle stairs complying with Section 1028.

**1009.6 Stairway construction.** All stairways shall be built of materials consistent with the types permitted for the type of construction of the building, except that wood handrails shall be permitted for all types of construction.

**1009.6.1 Stairway walking surface.** The walking surface of treads and landings of a stairway shall not be sloped steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. Stairway treads and landings shall have a solid surface. Finish floor surfaces shall be securely attached.

#### Exceptions:

1. Openings in stair walking surfaces shall be a size that does not permit the passage of  $\frac{1}{2}$ -inch-diameter (12.7 mm) sphere. Elongated opening shall be placed so that the long dimension is perpendicular to the direction of travel.
2. In Group F, H and S occupancies, other than areas of parking structures accessible to the public, openings in treads and landings shall not be prohibited provided a sphere with a diameter of  $1\frac{1}{8}$  inches (29 mm) cannot pass through the opening.

**1009.6.2 Outdoor conditions.** Outdoor stairways and outdoor approaches to stairways shall be designed so that water will not accumulate on walking surfaces. In other than occupancies in Group R-3, and occupancies in Group U that are accessory to an occupancy in Group R-3, treads, platforms and landings that are part of exterior stairways in climates subject to snow or ice shall be protected to prevent the accumulation of same.

**1009.6.3 Enclosures under stairways.** The walls and soffits within enclosed usable spaces under enclosed and unenclosed stairways shall be protected by 1-hour fire-resistance-rated construction or the fire-resistance rating of the stairway enclosure, whichever is greater. Access to the enclosed space shall not be directly from within the stair enclosure.

**Exception:** Spaces under stairways serving and contained within a single residential dwelling unit in Group R-2 or R-3 shall be permitted to be protected on the enclosed side with  $\frac{1}{2}$ -inch (12.7 mm) gypsum board.

There shall be no enclosed usable space under exterior exit stairways unless the space is completely enclosed in 1-hour fire-resistance-rated construction. The open space under exterior stairways shall not be used for any purpose.

**1009.7 Vertical rise.** A flight of stairs shall not have a vertical rise greater than 12 feet (3658 mm) between floor levels or landings.

#### Exceptions:

1. Aisle stairs complying with Section 1028.

2. Alternating tread devices used as a means of egress shall not have a rise greater than 20 feet (6096 mm) between floor levels or landings.

**1009.8 Curved stairways.** Curved stairways with winder treads shall have treads and risers in accordance with Section 1009.4 and the smallest radius shall not be less than twice the required width of the stairway.

**Exception:** The radius restriction shall not apply to curved stairways for occupancies in Group R-3 and within individual dwelling units in occupancies in Group R-2.

**1009.9 Spiral stairways.** Spiral stairways are permitted to be used as a component in the means of egress only within dwelling units or from a space not more than 250 square feet (23 m<sup>2</sup>) in area and serving not more than five occupants, or from galleries, catwalks and gridirons in accordance with Section 1015.6. A spiral stairway shall have a 7.5-inch (191 mm) minimum clear tread depth at a point 12 inches (305 mm) from the narrow edge. The risers shall be sufficient to provide a headroom of 78 inches (1981 mm) minimum, but riser height shall not be more than 9.5 inches (241 mm). The minimum stairway clear width at and below the handrail shall be 26 inches (660 mm).

**1009.10 Alternating tread devices.** Alternating tread devices are limited to an element of a means of egress in buildings of Groups F, H and S from a mezzanine not more than 250 square feet (23 m<sup>2</sup>) in area and which serves not more than five occupants; in buildings of Group I-3 from a guard tower, observation station or control room not more than 250 square feet (23 m<sup>2</sup>) in area and for access to unoccupied roofs.

**1009.10.1 Handrails of alternating tread devices.** Handrails shall be provided on both sides of alternating tread devices and shall comply with Section 1012.

**1009.10.2 Treads of alternating tread devices.** Alternating tread devices shall have a minimum projected tread of 5 inches (127 mm), a minimum tread depth of 8.5 inches (216 mm), a minimum tread width of 7 inches (178 mm) and a maximum riser height of 9.5 inches (241 mm). The projected tread depth shall be measured horizontally between the vertical planes of the foremost projections of adjacent treads. The riser height shall be measured vertically between the leading edges of adjacent treads. The combination of riser height and projected tread depth provided shall result in an alternating tread device angle that complies with Section 1002. The initial tread of the device shall begin at the same elevation as the platform, landing or floor surface.

**Exception:** Alternating tread devices used as an element of a means of egress in buildings from a mezzanine area not more than 250 square feet (23 m<sup>2</sup>) in an area which serves not more than five occupants shall have a minimum projected tread of 8.5 inches (216 mm) with a minimum tread depth of 10.5 inches (267 mm). The rise to the next alternating tread surface should not be more than 8 inches (203 mm).

**1009.11 Ship ladders.** Ship ladders are permitted to be used in Group I-3 as a component of a means of egress to and from

control rooms or elevated facility observation stations not more than 250 square feet (23 m<sup>2</sup>) with not more than three occupants and for access to unoccupied roofs. Ship ladders shall have a minimum tread depth of 5 inches (127 mm). The tread shall be projected such that the total of the tread depth plus the nosing projection is no less than 8½ inches (216 mm). The maximum riser height shall be 9½ inches (241 mm).

Handrails shall be provided on both sides of ship ladders. The minimum clear width at and below the handrails shall be 20 inches (508 mm).

**1009.12 Handrails.** Stairways shall have handrails on each side and shall comply with Section 1012. Where glass is used to provide the handrail, the handrail shall also comply with Section 2407.

**Exceptions:**

1. Handrails for aisle stairs are not required where permitted by Section 1028.13.
2. Stairways within dwelling units, spiral stairways and aisle stairs serving seating only on one side are permitted to have a handrail on one side only.
3. Decks, patios and walkways that have a single change in elevation where the landing depth on each side of the change of elevation is greater than what is required for a landing do not require handrails.
4. In Group R-3 occupancies, a change in elevation consisting of a single riser at an entrance or egress door does not require handrails.
5. Changes in room elevations of only one riser within dwelling units and sleeping units in Group R-2 and R-3 occupancies do not require handrails.
6. One handrail shall be allowed in enclosed exit stairs less than 44 inches (1118 mm) wide that do not serve as an accessible means of egress.

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**1009.13 Stairway to roof and roof access.** In buildings four or more stories or more than 40 feet (12 192 mm) in height above grade, one stairway shall extend to the roof surface through a stairway bulkhead complying with Section 1509.2, unless the roof has a slope steeper than 20 degrees (0.35 rad). Access to setback roof areas may be through a door or window opening to the roof. Stairs terminating at the level of a setback shall provide access to the setback roof areas, except where the setback is less than 4 feet (1219 mm) in width and 10 feet (3048 mm) in length, measured from the inside of the parapet wall.

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**1009.13.1 Occupancy Groups I-1, R-1 and R-2.** In buildings in Occupancy Groups I-1, R-1 and R-2 two stories or more in height, with roofs having a slope of 15 degrees (0.26 rad) or less, all interior stairs, except those terminating at the level of a setback roof, shall extend to the roof surface.

**Exceptions:**

1. In buildings in Occupancy Groups R-1 and R-2 two stories in height and in Occupancy Group R-2 three stories in height with not more than one dwelling unit per story, access to the roof shall be

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NYC permitted to be a noncombustible roof hatch or  
 NYC trap door not less than 21 inches (533 mm) in  
 NYC width and 28 inches (711 mm) in length. Such  
 NYC hatches shall be located within the stair enclosure  
 NYC and be provided with a stationary, noncombusti-  
 NYC ble access ladder or alternating tread device.

2. In buildings in Occupancy Group R-2 complying with Item 4 of Section 1021.2, roof access shall be governed by Item 4.6 of such section.

**1009.13.2 Protection at roof hatch openings.** Where the roof hatch opening providing the required access is located within 10 feet (3049 mm) of the roof edge, such roof access or roof edge shall be protected by guards installed in accordance with the provisions of Section 1013.

**1009.14 Stairway to elevator equipment.** Roofs and pent-houses containing elevator equipment that must be accessed for maintenance are required to be accessed by a stairway.

## SECTION BC 1010 RAMPS

**1010.1 Scope.** The provisions of this section shall apply to ramps used as a component of a means of egress.

### Exceptions:

1. Other than ramps that are part of the accessible routes providing access in accordance with Sections 1108.2 through 1108.2.4 and 1108.2.6, ramped aisles within assembly rooms or spaces shall conform with the provisions in Section 1028.11.
2. Curb ramps shall comply with ICC A117.1.
3. Vehicle ramps in parking garages for pedestrian exit access shall not be required to comply with Sections 1010.3 through 1010.9 when they are not an accessible route serving accessible parking spaces, other required accessible elements or part of an accessible means of egress.

NYC **1010.2 Slope.** Ramps used as part of a means of egress or  
 NYC part of an accessible route shall have a running slope not steeper than one unit vertical in 12 units horizontal (8-percent slope). The slope of other pedestrian ramps shall not be steeper than one unit vertical in eight units horizontal (12.5-percent slope).

### Exceptions:

1. Aisle ramp slope in occupancies of Group A shall comply with Section 1028.11.
2. In garages three stories or less in height and serving not more than one level below grade, ramps with a maximum slope of one unit vertical in seven units horizontal (14-percent slope) may serve as part of a nonaccessible means of egress.

**1010.3 Cross slope.** The slope measured perpendicular to the direction of travel of a ramp shall not be steeper than one unit vertical in 48 units horizontal (2-percent slope).

**1010.4 Vertical rise.** The rise for any ramp run shall be 30 inches (762 mm) maximum.

**1010.5 Minimum dimensions.** The minimum dimensions of means of egress ramps shall comply with Sections 1010.5.1 through 1010.5.3.

**1010.5.1 Width.** The minimum width of a means of egress ramp shall not be less than that required for corridors by Section 1018.2. The clear width of a ramp between handrails, if provided, or other permissible projections shall be 36 inches (914 mm) minimum.

**1010.5.2 Headroom.** The minimum headroom in all parts of the means of egress ramp shall not be less than 84 inches (2134 mm).

**1010.5.3 Restrictions.** Means of egress ramps shall not reduce in width in the direction of egress travel. Projections into the required ramp and landing width are prohibited. Doors opening onto a landing shall not reduce the clear width to less than 42 inches (1067 mm).

**1010.6 Landings.** Ramps shall have landings at the bottom and top of each ramp, points of turning, entrance, exits and at doors. Landings shall comply with Sections 1010.6.1 through 1010.6.5.

**1010.6.1 Slope.** Landings shall have a slope not steeper than one unit vertical in 48 units horizontal (2-percent slope) in any direction. Changes in level are not permitted.

**1010.6.2 Width.** The landing shall be at least as wide as the widest ramp run adjoining the landing.

**1010.6.3 Length.** The landing length shall be 60 inches (1525 mm) minimum.

### Exceptions:

1. In Group R-2 and R-3 individual dwelling and sleeping units that are not required to be Accessible units, Type B+NYC units or Type B units in accordance with Section 1107, landings are permitted to be 36 inches (914 mm) minimum.
2. Where the ramp is not a part of an accessible route, the length of the landing shall not be required to be more than 48 inches (1220 mm) in the direction of travel.

**1010.6.4 Change in direction.** Where changes in direction of travel occur at landings provided between ramp runs, the landing shall be 60 inches by 60 inches (1524 mm by 1524 mm) minimum.

**Exception:** In Group R-2 and R-3 individual dwelling or sleeping units that are not required to be Accessible units, Type B+NYC units or Type B units in accordance with Section 1107, landings are permitted to be 36 inches by 36 inches (914 mm by 914 mm) minimum.

**1010.6.5 Doorways.** Where doorways are located adjacent to a ramp landing, maneuvering clearances required by ICC A117.1 are permitted to overlap the required landing area.

**1010.7 Ramp construction.** All ramps shall be built of materials consistent with the types permitted for the type of construction of the building; except that wood handrails shall be permitted for all types of construction. Ramps used as an



## MEANS OF EGRESS

exit shall conform to the applicable requirements of Sections NYC 1022.1 and 1022.3 through 1022.5 for vertical exit enclosures.

**1010.7.1 Ramp surface.** The surface of ramps shall be of slip-resistant materials that are securely attached.

**1010.7.2 Outdoor conditions.** Outdoor ramps and outdoor approaches to ramps shall be designed so that water will not accumulate on walking surfaces. In other than occupancies in Group R-3, and occupancies in Group U that are accessory to an occupancy in Group R-3, surfaces and landings which are part of exterior ramps in climates subject to snow or ice shall be designed to minimize the accumulation of same.

**1010.8 Handrails.** Ramps with a rise greater than 6 inches (152 mm) shall have handrails on both sides. Handrails shall comply with Section 1012.

**Exception:** Handrails for ramped aisles are not required where permitted by Section 1028.13.

**1010.9 Edge protection.** Edge protection complying with Section 1010.9.1 shall be provided on each side of ramp runs and at each side of ramp landings not adjoining another ramp run or stairway.

### Exceptions:

1. Edge protection is not required on ramps that are not required to have handrails, provided they have flared sides that comply with the ICC A117.1 curb ramp provisions.
  2. Edge protection is not required on the sides of ramp landings having a vertical dropoff of not more than 0.5 inch (13 mm) within 10 inches (254 mm) horizontally of the required landing area.
  3. Edge protection is not required where the floor or ground surface of the ramp run or landing extends 12 inches (305 mm) minimum beyond the inside face of handrail complying with Section 1012.

**1010.9.1 Curb, rail, wall or barrier.** A curb, rail, wall or barrier serving as edge protection shall be provided as follows:

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1. Solid barriers. Solid barriers shall extend at least 4 inches (102 mm) from the floor or ground surface.
  2. Other types of barriers. Other types of barriers shall prevent the passage of a 4-inch-diameter (102 mm) sphere, where any portion of the sphere is within 4 inches (102 mm) of the floor or ground surface.

**1010.10 Guards.** Guards shall be provided where required by Section 1013 and shall be constructed in accordance with Section 1013. Such guards may be used to satisfy the requirement of edge protection of Section 1010.9.

## SECTION BC 1011 EXIT SIGNS

**1011.1 Where required.** Exits and exit access doors shall be marked by an approved exit sign readily visible from any

direction of egress travel. The path of egress travel to exits and within exits shall be marked by readily visible exit signs to clearly indicate the direction of egress travel in cases where the exit or the path of egress travel is not immediately visible to the occupants. Intervening means of egress doors within exits shall be marked by exit signs. Exit sign placement shall be such that no point in an exit access corridor or exit passageway is more than 100 feet (30 480 mm) or the listed viewing distance for the sign, whichever is less, from the nearest visible exit sign.

### Exceptions:

1. Exit signs are not required in rooms or areas that require only one exit or exit access.
2. Exit signs are not required in occupancies in Group U and individual sleeping units or dwelling units in Group I-1 or R. However, in a congregate living unit where the occupancy of such unit exceeds four people, exit signs shall be provided.
3. Exit signs are not required in dayrooms, sleeping rooms or dormitories in occupancies in Group I-3.
4. In occupancies in Groups A-4 and A-5, exit signs are not required on the seating side of vomitories or openings into seating areas where exit signs are provided in the concourse that are readily apparent from the vomitories. Such vomitories shall be provided with emergency egress lighting to identify each vomitory or opening within the seating area.

**1011.1.1 Signs within exits.** In high-rise buildings subject to Section 403, exit signs shall be placed within exits at horizontal extensions to indicate the transition from vertical to horizontal direction and at turns along the horizontal path.

**1011.2 Illumination.** Exit signs shall be internally or externally illuminated.

**Exception:** Tactile signs required by Section 1011.3 need not be provided with illumination.

**1011.3 Tactile exit signs.** A tactile sign stating EXIT and complying with ICC A117.1 shall be provided adjacent to each door to an area of rescue assistance, an exterior area for assisted rescue, and exit stairway, an exit ramp, an exit passageway, a horizontal exit and the exit discharge.

**1011.4 Internally illuminated exit signs.** Electrically powered exit signs shall be listed and labeled in accordance with UL 924, except that letters of exit signs shall be red. Exit signs shall be installed in accordance with the manufacturer's instructions and Chapter 27. Exit signs shall be illuminated at all times. The letters of exit signs shall be red.

**1011.4.1 Graphics.** The height of letters shall be not less than 6 inches (152 mm), except that in Group A and Group R- 1 occupancies letters shall be not less than 8 inches (203 mm) high. Graphics shall have letter widths, strokes and spacing in proportion to their height.

**1011.5 Externally illuminated exit signs.** Externally illuminated exit signs shall comply with Sections 1011.5.1 through 1011.5.3.

**1011.5.1 Graphics.** Every exit sign and directional exit sign shall have plainly legible letters not less than 6 inches (152 mm) high with the principal strokes of the letters not less than 0.75 inch (19.1 mm) wide. The word "EXIT" shall have letters having a width not less than 2 inches (51 mm) wide except the letter "I," and the minimum spacing between letters shall not be less than 0.375 inch (9.5 mm). In Group A and R-1 occupancies letters shall be not less than 8 inches (203 mm) high. Signs larger than the minimum established in this section shall have letter widths, strokes and spacing in proportion to their height.

The word "EXIT" shall be in high contrast with the background and shall be clearly discernible when the means of exit sign illumination is or is not energized. The letters of exit signs shall be red. If a chevron directional indicator is provided as part of the exit sign, the construction shall be such that the direction of the chevron directional indicator cannot be readily changed.

**1011.5.2 Exit sign illumination.** The face of an exit sign illuminated from an external source shall have an intensity of not less than 25 foot-candles (269.1 lux).

**1011.5.3 Power source.** Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27.

## SECTION BC 1012 HANDRAILS

**1012.1 Where required.** Handrails for stairways and ramps shall be adequate in strength and attachment in accordance with Section 1607.7. Handrails required for stairways by Section 1009.12 shall comply with Sections 1012.2 through 1012.9. Handrails required for ramps by Section 1010.8 shall comply with Sections 1012.2 through 1012.8.

**1012.2 Height.** Handrail height, measured above stair tread nosings, or finish surface of ramp slope, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm). Handrail height of alternating tread devices and ship ladders, measured above tread nosings, shall be uniform, not less than 30 inches (762 mm) and not more than 34 inches (864 mm).

**1012.3 Handrail graspability.** All required handrails shall comply with Section 1012.3.1 or shall provide equivalent graspability.

**Exception:** In Group R-3 occupancies; within dwelling units in Group R-2 occupancies; and in Group U occupancies that are accessory to a Group R-3 occupancy or accessory to individual dwelling units in Group R-2 occupancies; handrails shall be Type I in accordance with Section 1012.3.1, Type II in accordance with Section 1012.3.2 or shall provide equivalent graspability.

**1012.3.1 Type I.** Handrails with a circular cross section shall have an outside diameter of at least  $1\frac{1}{4}$  inches (32 mm) and not greater than 2 inches (51 mm). If the handrail is not circular, it shall have a perimeter dimension of at least 4 inches (102 mm) and not greater than  $6\frac{1}{4}$  inches (160 mm) with a maximum cross-section dimension of  $2\frac{1}{4}$  inches (57 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

**1012.3.2 Type II.** Handrails with a perimeter greater than  $6\frac{1}{4}$  inches (160 mm) shall provide a graspable finger recess area on both sides of the profile. The finger recess shall begin within a distance of  $\frac{3}{4}$  inch (19 mm) measured vertically from the tallest portion of the profile and achieve a depth of at least  $\frac{5}{16}$  inch (8 mm) within  $\frac{7}{8}$  inch (22 mm) below the widest portion of the profile. This required depth shall continue for at least  $\frac{3}{8}$  inch (10 mm) to a level that is not less than  $1\frac{3}{4}$  inches (45 mm) below the tallest portion of the profile. The minimum width of the handrail above the recess shall be  $1\frac{1}{4}$  inches (32 mm) to a maximum of  $2\frac{3}{4}$  inches (70 mm). Edges shall have a minimum radius of 0.01 inch (0.25 mm).

**1012.4 Continuity.** Handrail-gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

### Exceptions:

1. Handrails within dwelling units are permitted to be interrupted by a newel post at a turn or landing.
2. Within a dwelling unit, the use of a volute, turnout, starting easing or starting newel is allowed over the lowest tread.
3. Handrail brackets or balusters attached to the bottom surface of the handrail that do not project horizontally beyond the sides of the handrail within  $1\frac{1}{2}$  inches (38 mm) of the bottom of the handrail shall not be considered obstructions. For each  $\frac{1}{2}$  inch (12.7 mm) of additional handrail perimeter dimension above 4 inches (102 mm), the vertical clearance dimension of  $1\frac{1}{2}$  inches (38 mm) shall be permitted to be reduced by  $\frac{1}{8}$  inch (3 mm).
4. Where handrails are provided along walking surfaces with slopes not steeper than 1:20, the bottoms of the handrail gripping surfaces shall be permitted to be obstructed along their entire length where they are integral to crash rails or bumper guards.

**1012.5 Fittings.** Handrails shall not rotate within their fittings.

**1012.6 Handrail extensions.** Handrails shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent stair flight or ramp run. Where handrails are not continuous between flights, the handrails shall extend horizontally at least 12 inches (305 mm) beyond the top riser and continue to slope for the depth of one tread beyond the bottom riser. At ramps where handrails are not continuous between runs, the handrails shall extend horizontally above the landing 12 inches (305 mm) minimum beyond the top and bottom of ramp runs. The extensions of handrails

shall be in the same direction of the stair flights at stairways and the ramp runs at ramps.

**Exceptions:**

1. Handrails within a dwelling unit that is not an Accessible unit, Type B+NYC unit, or Type B unit need extend only from the top riser to the bottom riser.
2. Handrails within a Type B+NYC multistory dwelling unit that complies with Section 1107.2.5, Items 1 through 3, need extend only from the top riser to the bottom riser.
3. Aisle handrails in Group A and E occupancies in accordance with Section 1028.13.
4. Handrails for alternating tread devices and ship ladders are permitted to terminate at a location vertically above the top and bottom risers. Handrails for alternating tread devices and ship ladders are not required to be continuous between flights or to extend beyond the top or bottom risers.

**1012.7 Clearance.** Clear space between a handrail and a wall or other surface shall be a minimum of 1½ inches (38 mm). A handrail and a wall or other surface adjacent to the handrail shall be free of any sharp or abrasive elements.

**1012.8 Projections.** On ramps, the clear width between handrails shall be 36 inches (914 mm) minimum. Projections into the required width of stairways and ramps at each handrail shall not exceed 4½ inches (114 mm) at or below the handrail height. Projections into the required width shall not be limited above the minimum headroom height required in Section 1009.2.

**1012.9 Intermediate handrails.** Stairways shall have intermediate handrails located in such a manner that all portions of the stairway width required for egress capacity are within 30 inches (762 mm) of a handrail. On monumental stairs, handrails shall be located along the most direct path of egress travel.

## SECTION BC 1013 GUARDS

**1013.1 Where required.** Guards shall be located along open-sided walking surfaces, including mezzanines, equipment platforms, stairs, ramps and landings that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Guards shall be adequate in strength and attachment in accordance with Section 1607.7.

**Exception:** Guards are not required for the following locations:

1. On the loading side of loading docks or piers.
2. On the audience side of stages and raised platforms, including steps leading up to the stage and raised platforms.

3. On raised stage and platform floor areas such as runways, ramps and side stages used for entertainment or presentations.
4. At vertical openings in the performance area of stages and platforms.
5. At elevated walking surfaces appurtenant to stages and platforms for access to and utilization of special lighting or equipment.
6. Along vehicle service pits not accessible to the public.
7. In assembly seating where guards in accordance with Section 1028.14 are permitted and provided.

**1013.1.1 Glazing.** Where glass is used to provide a guard or as a portion of the guard system, the guard shall also comply with Section 2407. Where the glazing provided does not meet the strength and attachment requirements of Section 1607.7, complying guards shall also be located along glazed sides of open-sided walking surfaces.

**1013.2 Height.** Required guards shall be not less than 42 inches (1067 mm) high, measured vertically above the adjacent walking surfaces, adjacent fixed seating or the line connecting the leading edges of the treads.

**Exceptions:**

1. For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, guards on the open sides of stairs shall have a height not less than 34 inches (864 mm) measured vertically from a line connecting the leading edges of the treads.
2. For occupancies in Group R-3, and within individual dwelling units in occupancies in Group R-2, where the top of the guard also serves as a handrail on the open sides of stairs, the top of the guard shall not be less than 34 inches (864 mm) and not more than 38 inches (965 mm) measured vertically from a line connecting the leading edges of the treads.
3. The height in assembly seating areas shall be in accordance with Section 1028.14.
4. Along alternating tread devices and ship ladders, guards whose top rail also serves as a handrail, shall have height not less than 30 inches (762 mm) and not more than 34 inches (864 mm), measured vertically from the leading edge of the device tread nosing.

**1013.3 Opening limitations.** Required guards shall not have openings which allow passage of a sphere 4 inches (102 mm) in diameter from the walking surface to the required guard height.

**Exceptions:**

1. From a height of 36 inches (914 mm) to 42 inches (1067 mm), guards shall not have openings which allow passage of a sphere 4⅜ inches (111 mm) in diameter.
2. The triangular openings at the open sides of a stair, formed by the riser, tread and bottom rail shall not

allow passage of a sphere 6 inches (152 mm) in diameter.

3. At elevated walking surfaces for access to and use of electrical, mechanical or plumbing systems or equipment, guards shall not have openings which allow passage of a sphere 21 inches (533 mm) in diameter.
4. In areas that are not open to the public within occupancies in Group I-3, F, H or S, and for alternating tread devices and ship ladders, guards shall not have openings which allow passage of a sphere 21 inches (533 mm) in diameter.
5. In assembly seating areas, guards at the end of aisles where they terminate at a fascia of boxes, balconies and galleries shall not have openings which allow passage of a sphere 4 inches in diameter (102 mm) up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, guards shall not have openings which allow passage of a sphere 8 inches (203 mm) in diameter.
6. Within individual dwelling units and sleeping units in Group R-2 and R-3 occupancies, guards on the open sides of stairs shall not have openings which allow passage of a sphere  $4\frac{3}{8}$  (111 mm) inches in diameter.

**1013.4 Screen porches.** Porches and decks which are enclosed with insect screening shall be provided with guards where the walking surface is located more than 30 inches (762 mm) above the floor or grade below.

**1013.5 Mechanical equipment.** Guards shall be provided where appliances, equipment, fans, roof hatch openings or other components that require service are located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter. The guard shall extend not less than 30 inches (762 mm) beyond each end of such appliance, equipment, fan or component.

**1013.6 Roof access.** Guards shall be provided where the roof hatch opening is located within 10 feet (3048 mm) of a roof edge or open side of a walking surface and such edge or open side is located more than 30 inches (762 mm) above the floor, roof or grade below. The guard shall be constructed so as to prevent the passage of a sphere 21 inches (533 mm) in diameter.

## SECTION BC 1014 EXIT ACCESS

**1014.1 General.** The exit access shall comply with the applicable provisions of Sections 1003 through 1013. Exit access arrangement shall comply with Sections 1014 through 1019.

**1014.2 Egress through intervening spaces.** Egress through intervening spaces shall comply with this section.

1. Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas and the area served are accessory to; one or the other, are not a Group H occupancy and provide a discernible path of egress travel to an exit.

**Exception:** Means of egress are not prohibited through adjoining or intervening rooms or spaces in a Group H, S or F occupancy when the adjoining or intervening rooms or spaces are the same or a lesser hazard occupancy group.

2. An exit access shall not pass through a room that can be locked to prevent egress.
3. Means of egress from dwelling units or sleeping areas shall not lead through other sleeping areas, toilet rooms or bathrooms.
4. Egress shall not pass through kitchens, storage rooms, closets or spaces used for similar purposes.

### Exceptions:

1. Means of egress are not prohibited through a kitchen area serving adjoining rooms constituting part of the same dwelling unit or sleeping unit.
2. Means of egress are not prohibited through stockrooms in Group M occupancies when all of the following are met.
  - 2.1. The stock is of the same hazard classification as that found in the main retail area;
  - 2.2. Not more than 50 percent of the exit access is through the stockroom;
  - 2.3. The stockroom is not subject to locking from the egress side; and
  - 2.4. There is a demarcated, minimum 44-inch-wide (1118 mm) aisle defined by full- or partial-height fixed walls or similar construction that will maintain the required width and lead directly from the retail area to the exit without obstructions.

**1014.2.1 Multiple tenants.** Where more than one tenant occupies any one floor of a building or structure, each tenant space, dwelling unit and sleeping unit shall be provided with access to the required exits without passing through adjacent tenant spaces, dwelling units and sleeping units.

**Exception:** The means of egress from a smaller tenant space shall not be prohibited from passing through a larger adjoining tenant space where the following conditions are met:

1. Such rooms or spaces of the smaller tenant occupy less than 10 percent of the area of the larger tenant space through which they pass;
2. The larger tenant is a Group M occupancy and the smaller tenant space is of the same or similar occupancy group;
3. A discernible path of egress travel is provided from the smaller tenant space to an exit;

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1.2. A building that complies with Item 4 of Section 1021.2.

2. No intervening public hall shall be required where the doors opening to the apartments are smoke and draft controlled doors complying with UL 1784 without artificial bottom seals, in accordance with Section 715.3 and 715.3.5.3 and the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1. This exception shall not apply to any building that complies with Item 5 of Section 1021.2 where there is more than one apartment per story.

**1014.4.2 Group R-2 high-rise occupancies.** In high-rise buildings in Occupancy Group R-2, all doors from a dwelling unit shall open into an intervening public hall. Such public hall shall be constructed as a public corridor in accordance with Section 1018. Such public hall shall provide access to at least two exits.

**Exception:** Where the only dwelling units on a story of a building are the upper stories of multistory (duplex) dwelling units;

1. Any public halls shall be permitted to provide access to only one exit; or
2. No such public hall shall be required where smoke and draft controlled doors complying with UL 1784 without artificial bottom seals, in accordance with Sections 715.4 and 715.4.6.3, are provided. This exception shall not be construed to effect, alter, or change any requirement of this code to provide two means of egress from each apartment on each story.

## SECTION BC 1015 EXIT AND EXIT ACCESS DOORWAYS

**1015.1 Exits or exit access doorways from spaces.** Two exits or exit access doorways from any space shall be provided where one of the following conditions exists:

1. The occupant load of the space exceeds one of the values in Table 1015.1.
2. The common path of egress travel exceeds one of the limitations of Section 1014.3.
3. Where required by Section 1015.3, 1015.4, 1015.5, 1015.6 or 1015.6.1.

**Exception:** Group I-2 occupancies shall comply with Sections 1014.2.2 through 1014.2.7.

Where a building contains mixed occupancies, each individual occupancy shall comply with the applicable requirements for that occupancy. Where applicable, cumulative occupant loads from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.1.

**TABLE 1015.1  
SPACES WITH ONE EXIT OR EXIT ACCESS DOORWAY**

OCCUPANCY	MAXIMUM OCCUPANT LOAD
A, B, E <sup>a</sup> , M, U	74
F	49
H-1, H-2, H-3	3
H-4, H-5, I-1, I-3, I-4	10
I-2	See Sections 1014.2.2 through 1014.2.7
R	20
S	29

a. Day care maximum occupant load is 10.

### 1015.1.1 Three or more exits or exit access doorways.

Three exits or exit access doorways shall be provided from any space with an occupant load of 501 to 1,000. Four exits or exit access doorways shall be provided from any space with an occupant load greater than 1,000.

**1015.2 Exit or exit access doorway arrangement.** Required exits shall be located in a manner that makes their availability obvious. Exits shall be unobstructed at all times. Exit and exit access doorways shall be arranged in accordance with Sections 1015.2.1 and 1015.2.2.

**1015.2.1 Two exits or exit access doorways.** Where two exits or exit access doorways are required from any portion of the exit access, the exit doors or exit access doorways shall be placed a distance apart equal to not less than one-half of the length of the maximum overall diagonal dimension of the building or area to be served measured in a straight line between exit doors or exit access doorways. Stairs sharing any common wall, floors, ceilings, scissor stair assemblies, or other enclosures shall be counted as one exit stairway.

### Exceptions:

1. **Corridor measurements.** Where exit enclosures are provided as a portion of the required exit and are interconnected by a 1-hour fire-resistance-rated corridor conforming to the requirements of Section 1018, the required exit separation shall be measured along the shortest direct line of travel within the corridor.

2. **Remote location in sprinklered buildings.** Where a building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2, the separation distance of the exit doors or exit access doorways shall not be less than one-third of the length of the maximum overall diagonal dimension of the area served.

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**1015.3 Boiler, incinerator and furnace rooms.** Two exit access doorways are required in boiler, incinerator and furnace rooms where the area is over 500 square feet (46 m<sup>2</sup>) and any fuel-fired equipment exceeds 400,000 British thermal units (Btu) (422 000 KJ) input capacity. Where two exit access doorways are required, one is permitted to be a fixed ladder or an alternating tread device. Exit access doorways shall be separated by a horizontal distance equal to one-half the length of the maximum overall diagonal dimension of the room.

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exit, an exterior exit stairway or an exterior exit ramp, shall not exceed the distances given in Table 1016.1.

#### Exceptions:

1. Travel distance in open parking garages is permitted to be measured to the closest riser of open exit stairways.
2. In outdoor facilities with open exit access components and open exterior exit stairways or exit ramps, travel distance is permitted to be measured to the closest riser of an exit stairway or the closest slope of the exit ramp.
3. In all occupancies other than occupancy Groups H and I, the exit access travel distance to a maximum of 50 percent of the exits is permitted to be measured from the most remote point within a building to an exit using unenclosed exit access stairways or ramps when connecting a maximum of two stories. Each such interconnected story<sup>†</sup> shall have access to the minimum number of approved independent exits as required by Section 1021.1, but in no case shall there be less than two means of egress. Such interconnected stories shall not be open to other stories. Unenclosed exit stairways shall be remotely located in accordance with Section 1015.2.
4. In all occupancies other than occupancy Groups H and I, exit access travel distance is permitted to be measured from the most remote point within a building to an exit using unenclosed exit access stairways or ramps in the first and second stories above grade plane in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The first and second stories above grade plane shall have access to the minimum number of approved independent exits as required by Section 1021.1, but in no case shall there be less than two means of egress. Such interconnected stories shall not be open to other stories. Unenclosed exit stairways shall be remotely located in accordance with Section 1015.2.

Where applicable, travel distance on unenclosed exit access stairways or ramps and on connecting stories shall also be included in the travel distance measurement. The measurement along stairways shall be made on a plane parallel and tangent to the stair tread nosings in the center of the stairway.

**TABLE 1016.1**  
**EXIT ACCESS TRAVEL DISTANCE<sup>a</sup>**

OCCUPANCY	WITHOUT SPRINKLER SYSTEM (feet)	WITH SPRINKLER SYSTEM (feet)	
A	See Section 1028.7		NYC
E, F-1, M, R, S-1	150	200 <sup>b</sup>	NYC
B	200	300 <sup>c</sup>	
F-2, S-2, U	200	250 <sup>b</sup>	NYC
H-1	Not Permitted	75 <sup>c</sup>	
H-2	Not Permitted	100 <sup>c</sup>	
H-3	Not Permitted	150 <sup>c</sup>	
H-4	Not Permitted	175 <sup>c</sup>	
H-5	Not Permitted	200 <sup>c</sup>	
I-1, I-2, I-3, I-4	Not Permitted	200 <sup>c</sup>	NYC

For SI: 1 foot = 304.8 mm.

- See the following sections for modifications to exit access travel distance requirements:
  - Section 402.4: For the distance limitation in malls.
  - Section 404.9: For the distance limitation through an atrium space.
  - Section 407.4: For the distance limitation in Group I-2.
  - Sections 408.6.1 and 408.8.1: For the distance limitations in Group I-3.
  - Section 411.4: For the distance limitation in special amusement buildings.
  - Sections 1014.2.2 through 1014.2.7: For the distance limitation in Group I-2 hospital suites.
  - Section 1015.4: For the distance limitation in refrigeration machinery rooms.
  - Section 1015.5: For the distance limitation in refrigerated rooms and spaces.
  - Section 1021.2: For buildings with one exit.
  - Section 1028.7: For increased limitation in assembly seating.
  - Section 1028.7: For increased limitation for assembly open-air seating.
  - Section 3103.4: For temporary structures.
  - Section 3104.9: For pedestrian walkways.
- Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2. See Section 903 for occupancies where sprinkler systems according to Section 903.3.1.2 are permitted.
- Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

**1016.2 Exterior egress balcony increase.** Travel distances specified in Section 1016.1 shall be increased up to an additional 100 feet (30 480 mm) provided the last portion of the exit access leading to the exit occurs on an exterior egress balcony constructed in accordance with Section 1019. The length of such balcony shall not be less than the amount of the increase taken.

## SECTION BC 1017

### AISLES

**1017.1 General.** Aisles serving as a portion of the exit access in the means of egress system shall comply with the requirements of this section. Aisles shall be provided from all occupied portions of the exit access which contain seats, tables,



furnishings, displays and similar fixtures or equipment. Aisles serving assembly areas shall comply with Section 1028. Aisles serving reviewing stands, grandstands and bleachers shall also comply with Section 1028. The required width of aisles shall be unobstructed.

**Exception:** Doors complying with Section 1005.2.

**1017.2 Aisles in Groups B and M.** In Group B and M occupancies, the minimum clear aisle width shall be determined by Section 1005.1 for the occupant load served, but shall not be less than 36 inches (914 mm).

**Exception:** Nonpublic aisles serving less than 50 people and not required to be accessible by Chapter 11 need not exceed 28 inches (711 mm) in width.

**1017.3 Aisle accessways in Group M.** An aisle accessway shall be provided on at least one side of each element within the merchandise pad. The minimum clear width for an aisle accessway not required to be accessible shall be 30 inches (762 mm). The required clear width of the aisle accessway shall be measured perpendicular to the elements and merchandise within the merchandise pad. The 30-inch (762 mm) minimum clear width shall be maintained to provide a path to an adjacent aisle or aisle accessway. The common path of travel shall not exceed 30 feet (9144 mm) from any point in the merchandise pad.

**Exception:** For areas serving not more than 50 occupants, the common path of travel shall not exceed 75 feet (22 880 mm).

**1017.4 Seating at tables.** Where seating is located at a table or counter and is adjacent to an aisle or aisle accessway, the measurement of required clear width of the aisle or aisle accessway shall be made to a line 19 inches (483 mm) away from and parallel to the edge of the table or counter. The 19-inch (483 mm) distance shall be measured perpendicular to the side of the table or counter. In the case of other side boundaries for aisle or aisle accessways, the clear width shall be measured to walls, edges of seating and tread edges, except that handrail projections are permitted.

**Exception:** Where tables or counters are served by fixed seats, the width of the aisle accessway shall be measured from the back of the seat.

**1017.4.1 Aisle accessway for tables and seating.** Aisle accessways serving arrangements of seating at tables or counters shall have sufficient clear width to conform to the capacity requirements of Section 1005.1 but shall not have less than the appropriate minimum clear width specified in Section 1017.4.2.

**1017.4.2 Table and seating accessway width.** Aisle accessways shall provide a minimum of 12 inches (305 mm) of width plus  $\frac{1}{2}$  inch (12.7 mm) of width for each additional 1 foot (305 mm), or fraction thereof, beyond 12 feet (3658 mm) of aisle accessway length measured from the center of the seat farthest from an aisle.

**Exception:** Portions of an aisle accessway having a length not exceeding 6 feet (1829 mm) and used by a total of not more than four persons.

**1017.4.3 Table and seating aisle accessway length.** The length of travel along the aisle accessway shall not exceed 30 feet (9144 mm) from any seat to the point where a person has a choice of two or more paths of egress travel to separate exits.

## SECTION BC 1018 CORRIDORS

**1018.1 Construction.** Corridors shall be constructed in accordance with this section. Interior corridor walls required to be fire-resistance rated shall comply with Section 709 for fire partitions. Public corridor walls shall comply with Section 707 for fire barriers.

**1018.1.1 Interior corridors.** Interior corridors shall be fire-resistance rated in accordance with Table 1018.1.1.

### Exceptions:

1. A fire-resistance rating is not required for corridors in an occupancy in Group E where each room that is used for instruction has at least one door opening directly to the exterior and rooms for assembly purposes have at least one-half of the required means of egress doors opening directly to the exterior. Exterior doors specified in this exception are required to be at ground level.

TABLE 1018.1.1  
INTERIOR CORRIDOR FIRE-RESISTANCE RATING

OCCUPANCY	OCCUPANT LOAD SERVED BY INTERIOR CORRIDOR	REQUIRED FIRE-RESISTANCE RATING (hours)	
		Without sprinkler system	With sprinkler system <sup>c</sup>
H-1, H-2, H-3	All	Not Permitted	1
H-4, H-5	Greater than 30	Not Permitted	1
A, B, E, F, M, S, U	Greater than 30	1	0
R	Greater than 10	1 <sup>d</sup>	0
I-2 <sup>a</sup> , I-4	All	Not Permitted	0
I-1, I-3	All	Not Permitted	1 <sup>b</sup>

a. For requirements for occupancies in Group I-2, see Sections 407.2 and 407.3.

b. For a reduction in the fire-resistance rating for occupancies in Group I-3, see Section 408.8.

c. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 where allowed.

d. Interior corridors within dwelling or sleeping units in Group R occupancies pursuant to Section 1018.1.1, Exception 2 shall not require fire-resistance rating.

2. A fire-resistance rating is not required for corridors contained within a dwelling or sleeping unit in an occupancy in Group R.
3. A fire-resistance rating is not required for corridors in open parking garages.
4. A fire-resistance rating is not required for corridors in an occupancy in Group B which is a space requiring only a single means of egress complying with Section 1015.1.

**1018.1.2 Public corridors.** Public corridors shall be fire-resistance rated in accordance with Table 1018.1.2.

**TABLE 1018.1.2  
PUBLIC CORRIDOR FIRE-RESISTANCE RATING**

OCCUPANCY	REQUIRED FIRE-RESISTANCE RATING (hours)
H-1, H-2, H-3	2
H-4, H-5	1
A, E, F, M, S, U	1
B	1 <sup>a</sup>
R (Noncombustible)	1
R (Combustible)	2 <sup>b</sup>
I-1, I-2, I-3, I-4	1

- a. Public corridors need not be fire rated in high-rise buildings in Occupancy Group B equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, where such building is provided with smokeproof enclosures in stairways in accordance with Section 403.5.4.
- b. Public corridors in buildings not exceeding two stories in height, or that are three stories in height and occupied by not more than one family on each story, may be constructed with 1-hour fire-resistance rating.

**1018.2 Corridor width.** The minimum corridor width shall be as determined in Section 1005.1, but not less than 44 inches (1118 mm).

**Exceptions:**

1. Twenty-four inches (610 mm)—For access to and utilization of electrical, mechanical or plumbing systems or equipment.
2. Thirty-six inches (914 mm)—With a required occupant capacity of 50 or less, except as otherwise required by Chapter 11.
3. Thirty-six inches (914 mm)—Within a dwelling unit in Occupancy Groups I-1 and R-1, except as otherwise required by Section 1107.
4. Thirty inches (762 mm)—Within a dwelling unit in Occupancy Groups R-2 and R-3, except as otherwise required by Section 1107.
5. Sixty-six inches (1676 mm)—In Group E serving classrooms.
6. Seventy-two inches (1829 mm)—In corridors and areas serving gurney traffic in occupancies where patients receive outpatient medical care, which causes the patient to be not capable of self-preservation.

7. Ninety-six inches (2438 mm)—In Group I-2 in areas where required for bed movement.

**1018.3 Corridor obstruction.** The required width of corridors shall be unobstructed.

**Exception:** Doors complying with Section 1005.2.

**1018.4 Dead ends.** Where more than one exit or exit access doorway is required, the exit access shall be arranged such that there are no dead ends in corridors more than 20 feet (6096 mm) in length.

**Exceptions:**

1. In occupancies in Group I-3 of Occupancy Condition 2, 3 or 4 (see Section 308.4), the dead end in a corridor shall not exceed 50 feet (15 240 mm).
2. In occupancies in Groups B, E, F, I-1, M, R-1, S and U, where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the length of dead-end corridors shall not exceed 50 feet (15 240 mm).
3. Dead-end length not exceeding 2.5 times the least width of the dead-end corridor.
4. In occupancies in Group R-2, the dead end in a corridor shall not exceed 40 feet (12 192 mm). However, where the corridors are completely enclosed in construction having a 2-hour fire-resistance rating with all doors opening into the corridor being self-closing and having a fire-resistance rating of 1½ hours, the length of dead-end corridor shall not exceed 80 feet (24 384 mm).

**1018.5 Air movement in corridors.** Use of corridors as part of direct supply, return, or exhaust air system shall be subject to the limitations of the *New York City Mechanical Code*.

**1018.5.1 Corridor ceiling.** Use of the space between the corridor ceiling and the floor or roof structure above as a return air plenum shall be in accordance with the *New York City Mechanical Code*.

**1018.6 Corridor continuity.** Fire-resistance-rated corridors shall be continuous from the point of entry to an exit, and shall not be interrupted by intervening rooms.

**Exception:** Foyers, lobbies or reception rooms constructed as required for corridors shall not be construed as intervening rooms.

## SECTION BC 1019 EGRESS BALCONIES

**1019.1 General.** Balconies used for egress purposes shall conform to the same requirements as corridors for width, headroom, dead ends and projections.

**1019.2 Wall separation.** Exterior egress balconies shall be separated from the interior of the building by walls and opening protectives as required for corridors.

**Exception:** Separation is not required where the exterior egress balcony is served by at least two stairs and a dead-

end travel condition does not require travel past an unprotected opening to reach a stair.

**1019.3 Openness.** The long side of an egress balcony shall be at least 50 percent open, and the open area above the guards shall be so distributed as to minimize the accumulation of smoke or toxic gases.

**1019.4 Outdoor conditions.** Exterior egress balconies shall be designed to minimize accumulation of snow and ice that impedes the means of egress.

## SECTION BC 1020 EXITS

**1020.1 General.** Exits shall comply with Sections 1020 through 1026 and the applicable requirements of Sections 1003 through 1013. An exit shall not be used for any purpose that interferes with its function as a means of egress. Once a given level of exit protection is achieved, such level of protection shall not be reduced until arrival at the exit discharge.

**1020.2 Exterior exit doors.** Buildings or structures used for human occupancy shall have at least one exterior door that meets the requirements of Section 1008.1.1.

**1020.2.1 Detailed requirements.** Exterior exit doors shall comply with the applicable requirements of Section 1008.1.

**1020.2.2 Arrangement.** Exterior exit doors shall lead directly to the exit discharge or the public way.

## SECTION BC 1021 NUMBER OF EXITS AND CONTINUITY

**1021.1 Exits from stories.** All spaces within each story shall have access to the minimum number of approved independent exits as specified in Table 1021.1 based on the occupant load of such story. For the purposes of this chapter, occupied roofs shall be provided with exits as required for stories.

### Exceptions:

1. As modified by Section 403.5.2.
2. As modified by Section 1021.2.
3. Exit access stairways and ramps that comply with Exception 3 or 4 of Section 1016.1 shall be permitted to provide the minimum number of approved independent exits required by Table 1021.1 on each story.
4. Unless otherwise required by other provisions of this chapter, the number of exits from rooms and spaces within a story discharging directly to the exterior at the level of exit discharge shall be determined in accordance with Table 1015.1.

**TABLE 1021.1  
MINIMUM NUMBER OF EXITS FOR OCCUPANT LOAD**

OCCUPANT LOAD (persons per story)	MINIMUM NUMBER OF EXITS (per story)
1–500	2
501–1,000	3
More than 1,000	4

**1021.1.1 Exits maintained.** The required number of exits from any story shall be maintained until arrival at grade or the public way.

**1021.1.2 Open or enclosed parking garages.** Open or enclosed parking garages shall not have less than two exits from each parking tier. An unenclosed vehicle ramp constructed in accordance with Section 1010.2 may serve as one of the required exits when provided with pedestrian facilities along the ramp. Such ramps serving open or enclosed parking garages three stories or less in height and serving not more than one level below grade shall further comply with Section 1010.2, Exception 2.

**Exception:** Where vehicles are mechanically parked, only one exit is required but such exit shall not be a vehicle ramp.

**1021.2 Single exits.** Only one exit shall be required in buildings or from stories of buildings as described below:

1. Stories in buildings as described in Table 1021.2.
2. Buildings of Group R-3 occupancy.
3. Single-level buildings with the occupied space at the level of exit discharge provided that the story or space complies with Section 1015.1 as a space with one means of egress.
4. Buildings of Group R-2 occupancy where all of the following conditions are met:
  - 4.1. The building does not exceed four stories;
  - 4.2. The building contains not more than three dwelling units per story;
  - 4.3. The building is of construction Type I or II;
  - 4.4. The building does not exceed 2,500 square feet (232 m<sup>2</sup>) per story;
  - 4.5. Each dwelling unit has at least one window facing the street, or facing a lawful yard with open, unobstructed, and direct access to the street;
  - 4.6. The stairway extends to the roof surface through a stairway bulkhead complying with Section 1509.2 provided the roof has a slope not steeper than 20 degrees (0.35 rad). In lieu of the stairway bulkhead, the stair may be constructed against the street wall with one window facing the street at every landing and access to the roof is provided via a scuttle with a stationary, noncombustible access ladder;

**TABLE 1021.2**  
**STORIES WITH ONE EXIT<sup>a, f, g</sup>**

STORY	OCCUPANCY	MAXIMUM OCCUPANTS (OR DWELLING UNITS) PER FLOOR AND TRAVEL DISTANCE
First story or basement	A, B <sup>c</sup> , E <sup>d</sup> , F <sup>e</sup> , M, U, S <sup>c</sup>	49 occupants and 75 feet travel distance
	H-2, H-3	3 occupants and 25 feet travel distance
	H-4, H-5, I, R	10 occupants and 75 feet travel distance
	S <sup>a</sup>	29 occupants and 100 feet travel distance
Second story	B, F, M, S <sup>a</sup>	29 occupants and 75 feet travel distance
	R-2	4 dwelling units and 50 feet travel distance
Third story	R-2 <sup>b</sup>	4 dwelling units and 50 feet travel distance

For SI: 1 foot = 304.8 mm.

- For the required number of exits for open or enclosed parking garages, see Section 1021.1.2.
- Buildings classified as Group R-2 equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2 and provided with emergency escape and rescue openings in accordance with Section 1029.
- Group B, F and S occupancies in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall have a maximum travel distance of 100 feet.
- Day care occupancies shall have a maximum occupant load of 10.
- Mixed occupancies shall be permitted to be served by single exits provided each individual occupancy complies with the applicable requirements of Table 1021.2 for that occupancy.
- Where applicable, cumulative occupant loads from adjacent occupancies shall be considered in accordance with the provisions of Section 1004.1.
- Basements with a single exit shall not be located more than one story below grade plane.

- The stairway is enclosed in 2-hour fire-rated walls with all exit doors leading into the stairway having at least 1½-hour fire rating; and
- The building shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.2.
- Buildings of Group R-2 occupancy of construction Type I or II not exceeding six stories and not exceeding 2,000 square feet (186 m<sup>2</sup>) per story.

**1021.3 Exit continuity.** Exits shall be continuous from the point of entry into the exit to the exit discharge.

**1021.4 Exit door arrangement.** Exit door arrangement shall meet the requirements of Sections 1015.2 through 1015.2.2.

## SECTION BC 1022 EXIT ENCLOSURES

**1022.1 Enclosures required.** Interior exit stairways and interior exit ramps shall be enclosed with fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. Exit enclosures shall have a fire-resistance rating of not less than 2 hours where connecting four stories or more and not less than 1 hour where connecting less than four stories. The number of stories connected by the exit enclosure shall include any basements but not any mezzanines. Exit enclosures shall have a fire-resistance rating not less than the floor assembly penetrated, but need not exceed 2 hours. In Group R-1 and R-2 occupancies, where exit enclosures are required to have a fire-resistance rating of 2 hours, such enclosures shall be constructed of masonry or masonry equivalent. Wall assemblies constituting masonry equivalent shall be constructed in accordance with department rules. Exit enclosures shall lead directly to the exterior of the building or shall be extended to the exterior of the building with an exit passage-

way conforming to the requirements of Section 1023, except as permitted in Section 1027.1. An exit enclosure shall not be used for any purpose other than means of egress.

### Exceptions:

- In all occupancies, other than Group H and I occupancies, a stairway is not required to be enclosed when the stairway serves an occupant load of less than 10 and the stairway complies with either Item 1.1 or 1.2. In all cases, the maximum number of connecting open stories shall not exceed two.
  - The stairway is open to not more than one story above its level of exit discharge; or
  - The stairway is open to not more than one story below its level of exit discharge.
- Exits in buildings of Group A-5 where all portions of the means of egress are essentially open to the outside need not be enclosed.
- Stairways serving and contained within a single residential dwelling unit or sleeping unit in Group R-1, R-2 or R-3 occupancies are not required to be enclosed.
- Stairways in open parking structures that serve only the parking structure are not required to be enclosed.
- Stairways in Group I-3 occupancies as provided for in Section 408.3.8 are not required to be enclosed.
- Means of egress stairways as required by Sections 410.5.3 and 1015.6.1 are not required to be enclosed.
- Means of egress stairways from balconies, galleries or press boxes as provided for in Section 1028.5.1 are not required to be enclosed.



2. Where such equipment and ductwork is located within the exit enclosure, the intake air shall be taken directly from the outdoors and the exhaust air shall be discharged directly to the outdoors, or such air shall be conveyed through ducts enclosed in construction as required for shafts.

3. Where located within the building, such equipment and ductwork shall be separated from the remainder of the building, including other mechanical equipment, with construction as required for shafts. In each case, openings into the fire-resistance-rated construction shall be limited to those needed for maintenance and operation and shall be protected by opening protectives in accordance with Section 715 for shaft enclosures. Exit enclosure ventilation systems shall be independent of other building ventilation systems.

**1022.2.1 Extension.** Where an exit enclosure is extended to an exit discharge or a public way by an exit passageway, the exit enclosure shall be separated from the exit passageway by a fire barrier constructed in accordance with Section 707 or a horizontal assembly constructed in accordance with Section 712, or both. The fire-resistance rating shall be at least equal to that required for the exit enclosure. A fire door assembly complying with Section 715.4 shall be installed in the fire barrier to provide a means of egress from the exit enclosure to the exit passageway. Openings in the fire barrier other than the fire door assembly are prohibited. Penetrations of the fire barrier are prohibited.

**1022.6 Exit enclosure exterior walls.** Exterior walls of an exit enclosure shall comply with the requirements of Section 705 for exterior walls. Where nonrated walls or unprotected openings enclose the exterior of the stairway and the walls or openings are exposed to other parts of the building at an angle of less than 180 degrees (3.14 rad), the building exterior walls within 10 feet (3048 mm) horizontally of a non-rated wall or unprotected opening shall have a fire-resistance rating of not less than 1 hour. Openings within such exterior walls shall be protected by opening protectives having a fire protection rating of not less than  $\frac{3}{4}$  hour. This construction shall extend vertically from the ground to a point 10 feet (3048 mm) above the topmost landing of the stairway or to the roof line, whichever is lower.

**1022.7 Discharge identification.** A stairway in an exit enclosure shall not continue below its level of exit discharge unless an approved barrier is provided at the level of exit discharge to prevent persons from unintentionally continuing into levels below. Directional exit signs shall be provided as specified in Section 1011. An approved barrier shall consist of partitions, doors, or gates separating the portion of the vertical exit above grade from the portion below grade.‡ Where doors or gates are provided as approved barriers, such doors or gates shall be self-closing and opening in the direction of exit travel from the floors below grade.

**Exceptions:**

1. Such barrier separating the above-grade portion of the vertical exit from the portion below grade shall not be required in Group E and R-3 occupancies.

2. Such barrier separating the above-grade portion of the vertical exit from the portion below grade shall not be required where the stairway design is intended to continue the path of egress through a below grade level.

**1022.8 Stairway identification and floor level signs.** Signs identifying stairways and floor levels shall comply with Sections 1022.8.1 through 1022.8.5.

- 1022.8.1 Stairway identification signs.** A stairway identification sign indicating each stair by alphabetic letter shall be posted on both sides of each stair door.

**1022.8.2 Floor identification signs.** A floor identification sign shall be provided at each floor landing within exit enclosures connecting more than three stories.‡ Such sign shall designate:

1. The floor level;
2. The terminus of the top and bottom of the exit enclosure;‡
3. The identification of the stair or ramp;
4. The story of the exit discharge; and
5. The availability of roof access from the enclosure for the Fire Department.

The signs shall be located 5 feet (1524 mm) above the floor landing in a position that is readily visible when the doors are in the open and closed positions.

**1022.8.3 Tactile floor level identification signs.** Floor level identification signs in tactile characters complying with ICC A117.1 shall be located at each floor level landing adjacent to the door on the stair side.

**1022.8.4 Signage requirements.** Stairway and floor identification signs required by Sections 1022.8.1 and 1022.8.2 shall comply with all of the following requirements:

1. The signs shall be a minimum size of 18 inches (457 mm) by 12 inches (305 mm).
2. The alphabetic letters designating the identification of the stair enclosure shall be a minimum of 1½ inches (38 mm) in height.
3. The number designating the floor level shall be a minimum of 5 inches (127 mm) in height and located in the center of the sign.
4. All other lettering and numbers shall be a minimum of 1 inch (25 mm) in height.
5. Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.
6. When signs required by Section 1022.8 are installed in interior exit enclosures of buildings subject to Section 1024, the signs shall be made of the same luminous materials as required by Section 1024.4.

**1022.8.5 Directions to openable doors.** Where doors serving vertical exit enclosures are locked on the stair side, signage shall be posted in compliance with Sections 1030.4.1, 1030.4.2 and 1030.4.3.

#### **1022.9 Smokeproof enclosures and pressurized stairways.**

In buildings required to comply with Section 403 or 405, each of the exit enclosures serving a story with a floor surface located more than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access or more than 30 feet (9144 mm) below the finished floor of a level of exit discharge serving such stories shall be a smokeproof enclosure or pressurized stairway in accordance with Section 909.20.

**1022.9.1 Termination and extension.** A smokeproof enclosure or pressurized stairway shall terminate at an

exit discharge or a public way. The smokeproof enclosure or pressurized stairway shall be permitted to be extended by an exit passageway in accordance with Section 1022.2. The exit passageway shall be without openings other than the fire door assembly required by Section 1022.2 and those necessary for egress from the exit passageway. The exit passageway shall be separated from the remainder of the building by 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed‡ in accordance with Section 712, or both.

#### **Exceptions:**

1. Openings in the exit passageway serving a smokeproof enclosure are permitted where the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure, and openings are protected as required for access from other floors.
2. Openings in the exit passageway serving a pressurized stairway are permitted where the exit passageway is protected and pressurized in the same manner as the pressurized stairway.
3. The fire barrier separating the smokeproof enclosure or pressurized stairway from the exit passageway is not required, provided the exit passageway is protected and pressurized in the same manner as the smokeproof enclosure or pressurized stairway.
4. A smokeproof enclosure or pressurized stairway shall be permitted to egress through areas on the level of discharge or vestibules as permitted by Section 1027.

**1022.9.2 Enclosure access.** Access to the stairway within a smokeproof enclosure shall be by way of a vestibule or an open exterior balcony.

**Exception:** Access is not required by way of a vestibule or exterior balcony for stairways using the pressurization alternative complying with Section 909.20.5.

## **SECTION BC 1023 EXIT PASSAGEWAYS**

**1023.1 Exit passageway.** Exit passageways serving as an exit component in a means of egress system shall comply with the requirements of this section. An exit passageway shall not be used for any purpose other than as a means of egress.

**1023.2 Width.** The width of exit passageways shall be determined as specified in Section 1005.1 but such width shall not be less than 44 inches (1118 mm), except that exit passageways serving an occupant load of less than 50 shall not be less than 36 inches (914 mm) in width.

The required width of exit passageways shall be unobstructed.

**Exception:** Doors complying with Section 1005.2.

**1023.3 Construction.** Exit passageway enclosures shall have walls, floors and ceilings of not less than 1-hour fire-resistance rating, and not less than that required for any connecting exit enclosure. Exit passageways shall be constructed as fire barriers in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**1023.4 Termination.** Exit passageways shall terminate at an exit discharge or a public way.

**1023.5 Openings and penetrations.** Exit passageway opening protectives shall be in accordance with the requirements of Section 715.

Except as permitted in Section 402.4.6, openings in exit passageways other than unexposed exterior openings shall be limited to those necessary for exit access to the exit passageway from normally occupied spaces and for egress from the exit passageway.

Where an exit enclosure is extended to an exit discharge or a public way by an exit passageway, the exit passageway shall also comply with Section 1022.2.1.

Elevators shall not open into an exit passageway.

**1023.6 Penetrations.** Penetrations into and openings through an exit passageway are prohibited except for required exit doors, equipment and ductwork necessary for independent pressurization, sprinkler piping, standpipes, electrical raceway for fire department communication and electrical raceway serving the exit passageway and terminating at a steel box not exceeding 16 square inches (0.010 m<sup>2</sup>). Such penetrations shall be protected in accordance with Section 713. There shall be no penetrations or communicating openings, whether protected or not, between adjacent exit passageways.

## SECTION BC 1024 LUMINOUS EGRESS PATH MARKINGS

**1024.1 General.** Approved luminous egress path markings delineating the exit path shall be provided in all high-rise buildings subject to Section 403.5 having occupied floors located more than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access in accordance with Sections 1024.1 through 1024.9.

### Exceptions:

1. Luminous egress path markings shall not be required on the level of exit discharge in lobbies that serve as part of the exit path in accordance with Section 1027.1, Exception 1.
2. Luminous egress path markings shall not be required in areas of open parking garages that serve as part of the exit path in accordance with Section 1027.1, Exception 3.

**1024.2 Required markings.** Egress path markings shall be provided in exit enclosures, including vertical exit enclosures, horizontal exits, and exit passageways, in accordance with Sections 1024.2.1 through 1024.2.9. Entrances to exit

enclosures shall be provided with exit signs in compliance with Section 1024.2.6.1.

**1024.2.1 Steps.** A solid and continuous stripe shall be applied to the horizontal leading edge of each step and shall extend for the full length of the step. Outlining stripes shall have a minimum horizontal width of 1 inch (25 mm) and a maximum width of 2 inches (51 mm). The leading edge of the stripe shall be placed at a maximum of 1/2 inch (13 mm) from the leading edge of the step and the stripe shall overlap the leading edge of the step by not more than 1/2 inch (13 mm) down the vertical face of the step. Outlining stripes on steps shall comply with Figure S101.1(2) of Appendix S.

**Exception:** The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

**1024.2.2 Landings.** The leading edge of landings shall be marked with a stripe consistent with the dimensional requirements for steps. Stripes on landings shall comply with Figure S101.1(3) of Appendix S.

**1024.2.3 Handrails.** All handrails and handrail extensions shall be marked with a solid and continuous stripe having a minimum width of 1 inch (25 mm). The stripe shall be placed on the top surface of the handrail for the entire length of the handrail, including extensions and newel post caps. Where handrails or handrail extensions bend or turn corners, the stripe shall not have a gap of more than 4 inches (102 mm). Stripes on handrails shall comply with Figure S101.1(4) of Appendix S.

**Exception:** The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

**1024.2.4 Perimeter demarcation lines.** Stair landings and other floor areas within exit enclosures, with the exception of the sides of steps, shall be provided with solid and continuous demarcation lines on the floor or on the walls or a combination of both. The stripes shall be 1 to 2 inches (25 mm to 51 mm) wide with interruptions not exceeding 4 inches (102 mm).

**Exception:** The minimum width of 1 inch (25 mm) shall not apply to outlining stripes listed in accordance with UL 1994.

**1024.2.4.1 Floor-mounted demarcation lines.** Perimeter demarcation lines shall be placed within 4 inches (102 mm) of the wall and shall extend to within 2 inches (51 mm) of the markings on the leading edge of landings. The demarcation lines shall continue across the floor in front of all doors. Perimeter demarcation lines shall comply with Figure S101.1(5) of Appendix S.

### Exceptions:

1. Demarcation lines shall not extend in front of exit doors that lead out of an exit enclosure and through which occupants must travel to complete the exit path.



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- Demarcation lines shall be continuous but need not extend into an area such as a dead end or an obstruction that is selected not to be outlined because it is not part of the egress path.

**1024.2.4.2 Wall-mounted demarcation lines.** Perimeter demarcation lines shall be placed on the wall with the bottom edge of the stripe no more than 4 inches (102 mm) above the finished floor. At the top or bottom of the stairs, demarcation lines shall drop vertically to the floor within 2 inches (51 mm) of the step or landing edge. Demarcation lines on walls shall transition vertically to the floor and then extend across the floor where a line on the floor is the only practical method of outlining the path. Where the wall line is broken by a door, demarcation lines on walls shall continue across the face of the door or transition to the floor and extend across the floor in front of such door. Wall-mounted demarcation lines shall comply with Figure S101.1(8) of Appendix S.

**Exceptions:**

- Demarcation lines shall not extend in front of exit doors that lead out of an exit enclosure and through which occupants must travel to complete the exit path.
- Perimeter demarcation lines are not required on the sides of steps.
- Perimeter demarcation lines are not required where an area such as a dead end or an obstruction is selected not to be outlined because it is not part of the egress path, the demarcation lines shall not be required in such area provided that a demarcation line is continuous across the floor.

**1024.2.4.3 Transition.** Where a wall-mounted demarcation line transitions to a floor-mounted demarcation line, or vice versa, the wall-mounted demarcation line shall drop vertically to the floor to meet a complementary extension of the floor-mounted demarcation line, thus forming a continuous marking. Transitioning demarcation lines shall comply with Figure S101.1(7) of Appendix S.

**1024.2.5 Obstacles.** Obstacles at or below 6 feet 6 inches (1981 mm) in height and projecting more than 4 inches (102 mm) into the egress path shall be outlined with markings no less than 1 inch (25 mm) in width comprised of a pattern of alternating equal bands, of luminescent luminous material and black, with the alternating bands no more than 2 inches (51 mm) thick and angled at 45 degrees (0.79 rad). Obstacles shall include, but are not limited to, standpipes, hose cabinets, wall projections and restricted height areas. However, such markings shall not conceal any required information or indicators including, but not limited to, instructions to occupants for the use of standpipes. Markings on obstacles shall comply with Figure S101.1(6) of Appendix S.

**1024.2.6 Doors from exit enclosures.** Doors through which occupants within an exit enclosure must pass in

order to complete the exit path, and doors serving horizontal exits, shall be provided with markings complying with Sections 1024.2.6.1 through 1024.2.6.3 of this chapter and Figures S101.1(11) and S101.1(12) of Appendix S. Exit discharge doors shall further comply with Section 1024.2.6.1.2.

**1024.2.6.1 Emergency exit symbol.** The doors shall be identified by a low-location luminous emergency exit symbol complying with Section 1024.6.1. The exit symbol shall be a minimum of 4 inches (102 mm) in height and shall be mounted on the door itself in accordance with Section 1024.2.6.1.1. Such signs shall be no higher than 18 inches (457 mm) above the finished floor.

**1024.2.6.1.1 Mounting location.** The vertical centerline of the sign shall be centered with the door, or shall be in that half of the door, either the right or left, that contains the latch. In case of double-doors, both doors shall be marked and the signs shall be centered with the doors. Arrows may be omitted on door-mounted signs. Door-mounted signs shall comply with Figure S101.1(1) in Appendix S.

**1024.2.6.1.2 Exit discharge doors.** At doors serving as exit discharge, a sign in compliance with Section 1024.2.6.1.1 shall contain supplemental directional text such as "FINAL EXIT," "EXIT THROUGH LOBBY," or "EXIT TO STREET" in sans serif letters one-half as high as the word EXIT. Exit discharge door sign shall comply with Figure S101.1(13) in Appendix S.

**1024.2.6.2 Door hardware markings.** Door hardware shall be marked with no less than 16 square inches (406 mm<sup>2</sup>) of luminous material. This marking shall be located behind, immediately adjacent to or on the door handle and/or escutcheon. Where a panic bar is installed, such material shall be no less than 1 inch (25 mm) wide for the entire length of the actuating bar or touchpad. Additional hardware markings may include ANSI Z 535.1 safety green graphics such as arrows indicating door handle turning directions, or emergency egress symbols as per NFPA 170, the word "EXIT," the word "PUSH," and similar egress-related symbols, provided the minimum 16 square inches (406 mm<sup>2</sup>) of luminous materials is maintained.

**1024.2.6.3 Door frame markings.** The top and sides of the door frame shall be marked with a solid and continuous 1 inch to 2 inch (25 mm to 51 mm) wide stripe. Where the door molding does not provide sufficient flat surface on which to locate the stripe, the stripe shall be permitted to be located on the wall surrounding the frame.

**1024.2.7 Directional signage upon entering an exit enclosure.** Luminous directional signs designed in compliance with Section 1024.6.1 shall be placed in the exit enclosure at every entrance thereto such that they are readily visible when the doors are in the open and closed positions. Such directional sign shall include an arrow indicating the direction of travel. The word "EXIT" shall

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not be required. The signs shall be located such that their top edge is within 18 inches (457 mm) above the finished floor. Directional signs shall comply with Figure S101.1(9) in Appendix S.

**1024.2.8 Directional signage at transfer levels and where egress direction is not clear.** Luminous directional signs designed in compliance with Section 1024.6.1 and installed at heights indicated in Section 1024.2.7 shall be placed on the wall at transfer levels and wherever egress direction is not clear; including at turns along horizontal extensions, at transitions from vertical to horizontal direction and at a “T” intersection. These directional signs shall include arrows indicating the direction of travel. The word “EXIT” shall not be required. Directional signs at transfer levels shall comply with Figure S101.1(9) in Appendix S.

**1024.2.9 “No Exit” sign.** Luminous signs shall be placed on doors along the egress path that lead to dead ends (mechanical rooms, storage closets, etc.). Such signs shall contain sans serif lettering at least 1 inch (25 mm) high reading “NO EXIT,” with the “NO” centered above the “EXIT.” The “NO” may be a larger size than the “EXIT” for clarity. The nonluminous portion of such signs shall not be green. No-exit signs shall comply with Figure S101.1(10) in Appendix S.

**1024.3 Uniformity.** Placement and dimensions of markings shall be consistent and uniform throughout the same exit enclosure.

**1024.3.1 Solid and continuous.** For the purposes of this section, solid and continuous means without gaps or interruption, except as required for the control of expansion and contraction. A series of dashes, chevrons, dots, or other similar patterns is not solid and continuous. Luminous materials shall be considered solid and continuous if they occasionally contain the following safety green (ANSI Z 535.1) symbols or text:

1. The word “EXIT”;
2. Egress symbol as per NFPA 170;
3. Direction arrows as per NFPA 170; or
4. Other text or symbols as approved by the commissioner.

**1024.4 Self-luminous and photoluminescent.** Luminous egress path markings shall be permitted to be made of any material including paint, provided that an electrical charge is not required to maintain the required luminance. Such materials shall include, but are not limited to, self-luminous materials and photoluminescent materials. Materials shall comply with either:

1. UL 1994; or
2. ASTM E 2072, except that the charging source shall be 1 foot-candle (11 lux) of fluorescent illumination for 60 minutes, and the minimum luminance shall be 30 millicandelas per square meter at 10 minutes and 5 millicandelas per square meter after 90 minutes.

**1024.4.1 Labeling.** All approved materials shall be labeled and identified with the manufacturer’s name, model number and the name of the approved agency in a

minimum of 6 point type with at least one such identification on each piece of material installed. However, labeling is not required for pieces of material less than 1 foot in length that are placed in immediate proximity of an identical model that is labeled. Materials may include supplemental identifying information such as the trade name or “NYC.”

#### 1024.5 Reserved.

**1024.6 General standards.** Luminous materials shall comply with the design standards of Sections 1024.6.1 and 1024.6.2.

**1024.6.1 Design of door and directional signs.** Unless otherwise specified, all photoluminescent door signs and directional signs:

1. May be either positive or negative image;
2. Shall be made with the non-photoluminescent portions of the signs in safety green as per ANSI Z535.1; and
3. Shall include three components:
  - 3.1. The word “EXIT” printed in sans serif letters at least 4 inches high (102 mm) with strokes no less than  $\frac{1}{2}$  inch (13 mm);
  - 3.2. An emergency exit symbol at least 4 inches high (102 mm), complying with NFPA 170; and
  - 3.3. An arrow at least  $2\frac{3}{4}$  inches (70 mm) high, complying with NFPA 170.

Design of door and directional sign shall comply with Figures S101.1(9), S101.1(13), S101.1(14) and S101.1(15) of Appendix S.

**1024.6.1.1 Additional text for sign subject to this section.** Additional descriptive text is permitted, provided such words are in sans serif letters and, where the word “EXIT” or the emergency symbol is required on such sign, such a descriptive text is no more than one-half as high as the word “EXIT” or the emergency exit symbol.

**1024.6.2 Figures.** The figures in Appendix S are intended only for illustration, and where there is a conflict between the figures and this section, this section shall govern.

**1024.7 Voluntary installation.** Where luminous egress path markings are not required but are voluntarily installed in the exit path, such markings shall comply with Section 1024.

**1024.8 Special inspection.** Luminous exit path markings shall be subject to special inspection in accordance with Sections 1024.8.1 through 1024.8.3.

**1024.8.1 Inspection.** A registered design professional shall verify by visual inspection that all components have been installed in accordance with Section 1024, both with the normal lighting turned on and with the normal and emergency lighting turned off.

**1024.8.2 Product identification.** A registered design professional shall review the manufacturer product literature and information from the testing agency and verify that the products installed are labeled as meeting the standards in

**1024.8.3 Paints.** Where in situ painting was utilized, a registered design professional shall field-verify that the specified paint was utilized in accordance with the manufacturer's recommended methods of application.

## SECTION BC 1025 HORIZONTAL EXITS

### Exceptions:

1. Horizontal exits are permitted to comprise two-thirds of the required exits from any building or floor area for occupancies in Group I-2.
2. Horizontal exits are permitted to comprise 100 percent of the exits required for occupancies in Group I-3. At least 6 square feet (0.6 m<sup>2</sup>) of accessible space per occupant shall be provided on each side of the horizontal exit for the total number of people in adjoining compartments.

**SECTION BC 1026**  
**EXTERIOR EXIT RAMPS AND STAIRWAYS**

**1026.2 Use in a means of egress.** Exterior exit stairways shall not be used as an element of a required means of egress for Group I-2 occupancies. For all occupancies other than Group I-2, exterior exit ramps and stairways shall be permitted as an element of a required means of egress for buildings not exceeding six stories above grade plane or having

occupied floors more than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access.

**1026.3 Open side.** Exterior exit ramps and stairways serving as an element of a required means of egress shall be open on at least one side. An open side shall have a minimum of 35 square feet (3.3 m<sup>2</sup>) of aggregate open area adjacent to each floor level and the level of each intermediate landing. The required open area shall be located not less than 42 inches (1067 mm) above the adjacent floor or landing level.

**NYC 1026.4 Adjoining open areas.** The open areas adjoining exterior exit ramps or stairways shall be either yards, courts or public ways; the remaining sides are permitted to be enclosed by the exterior walls of the building.

**1026.5 Location.** Exterior exit ramps and stairways shall be located in accordance with Section 1027.3.

**1026.6 Exterior ramps and stairway protection.** Exterior exit ramps and stairways shall be separated from the interior of the building as required in Section 1022.1. Openings shall be limited to those necessary for egress from normally occupied spaces.

### Exceptions:

1. In all occupancies other than Group R-1 or R-2, separation from the interior of the building is not required in buildings that are no more than two stories above grade plane where a level of exit discharge serving such occupancies is the first story above grade plane.
2. Separation from the interior of the building is not required where the exterior ramp or stairway is served by an exterior ramp or balcony that connects two remote exterior stairways or other approved exits, with a perimeter that is not less than 50 percent open. To be considered open, the opening shall be a minimum of 50 percent of the height of the enclosing wall, with the top of the openings no less than 7 feet (2134 mm) above the top of the balcony.
3. Separation from the interior of the building is not required for an exterior ramp or stairway located in a building or structure that is permitted to have unenclosed interior stairways in accordance with Section 1022.1.
4. Separation from the interior of the building is not required for exterior ramps or stairways connected to open-ended corridors, provided that Items 4.1 through 4.4 are met:
  - 4.1. The building, including corridors, ramps and stairs, shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
  - 4.2. The open-ended corridors comply with Section 1018.
  - 4.3. The open-ended corridors are connected on each end to an exterior exit ramp or stairway complying with Section 1026.
  - 4.4. At any location in an open-ended corridor where a change of direction exceeding 45

degrees (0.79 rad) occurs, a clear opening of not less than 35 square feet (3.3 m<sup>2</sup>) or an exterior ramp or stairway shall be provided. Where clear openings are provided, they shall be located so as to minimize the accumulation of smoke or toxic gases.

**1026.7 Fire towers.** Fire towers may be used as exits in lieu of interior stairs provided they comply with all of the requirements for stairways as per Section 1009, except as modified below.

**1026.7.1 Enclosure.** The enclosing walls of fire towers shall be of noncombustible materials or assemblies having a fire-resistance rating of at least 4 hours. Such walls shall be without openings, except for doors serving as means of egress.

**1026.7.2 Access.** At each story served by a fire tower, access to the stairways of such fire tower shall be provided through outside balconies or fireproof vestibules. Such balconies or vestibules shall be at least 44 inches (1118 mm) in width and shall have unpierced floors of noncombustible materials and shall be provided with substantial guard railings at least 4 feet (1219 mm) high, without any openings greater than 5 inches (127 mm) in width.

**1026.7.3 Balconies and vestibules.** Such balconies or vestibules of fire towers shall be level with the floors of the structure and the platforms of the stairs connected by such balconies. Such balconies or vestibules shall be separated from the structure and the stairs by self-closing swinging doors with a one and 1/2-hour fire protection rating, capable of being opened from both sides without the use of a key or other unlocking device.

Balconies or vestibules of fire towers shall open on a street or yard, or on a court open vertically to the sky for its full height, having a minimum net area of 105 square feet (9.7 m<sup>2</sup>) and a minimum dimension of 7 feet (2134 mm). The opening from the vestibule to the street, yard or court shall have a minimum area of 18 square feet (1.7 m<sup>2</sup>) and a minimum dimension of 30 inches (762 mm). It shall be unlawful to leave openings in the court walls surrounding an interior fire tower, other than the openings from the vestibules, within 15 feet (4572 mm) of the balcony, except that self-closing windows with a <sup>3</sup>/<sub>4</sub>-hour fire protection rating may be used if such windows are at least 10 feet (3048 mm) from the balcony, provided that the area of the court is at least 12 feet by 24 feet (3658 mm by 7315 mm).

**1026.7.4 Termination.** Fire towers shall terminate at grade level and shall exit directly to the street independently of corridors serving other stairways, except when the fire tower terminates in the ground floor corridor outside of the inner vestibule and within 10 feet (3048 mm) of the building line.



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Where an egress court exceeds the minimum required width and the width of such egress court is then reduced along the path of exit travel, the reduction in width shall be gradual. The transition in width shall be affected by a guard not less than 36 inches (914 mm) in height and shall

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**Exception:** Protection of exterior walls shall not be required where:

- 1027.6 Access to a public way.** The exit discharge shall provide a direct and unobstructed access to a public way.

1. The area shall be of a size to accommodate at least 5 square feet (0.46 m<sup>2</sup>) for each person.
2. The area shall be located on the same lot at least 50 feet (15 240 mm) away from the building requiring egress.
3. The area shall be permanently maintained and identified as a safe dispersal area.
4. The area shall be provided with a safe and unobstructed path of travel from the building.
5. The area shall be illuminated in accordance with Section 1006.1.

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OCCUPANCY BY MORE THAN . . . . . PERSONS IS  
DANGEROUS AND UNLAWFUL

Certificate of Operation No . . . . .

Commissioner, Dept. of Buildings, City of New York

**1028.1.2.1 Multiple-occupant load sign.** When a space is occupied for multiple purposes involving different occupant loads the sign shall read as follows:

## OCCUPANCY BY MORE THAN

(number) . . . . PERSONS AS (type of occupancy) . . .

OR BY

(number) . . . . . PERSONS AS (type of occupancy) . . .

OR BY

(number) . . . . PERSONS AS (type of occupancy) . . .

IS DANGEROUS AND UNLAWFUL

Certificate of Operation No . . . . .

Commissioner, Dept. of Buildings, City of New York

**1028.1.2.2 Design of capacity signs.** Signs shall be at least 12 inches (305 mm) wide and 16 inches (406 mm) high. The lettering shall be red on a white background. The letters shall be at least 1 inch (25 mm) high and the numerals at least 1<sup>1</sup>/<sub>4</sub> inches (32 mm) high. Signs shall be framed under a transparent protective cover, and permanently mounted in a location that is conspicuously visible to a person entering the space. Signs shall be lighted by artificial illumination at all times during occupancy to maintain at least 5 foot-candles (54 lux) on the surface of the sign.

**1028.1.3 Approved plans.** In every place of assembly providing seating or other moveable furnishings, copies of approved plans and approved alternate plans shall be kept on the premises. The plans shall be readily available for inspection, and shall provide the following information:

1. For assembly spaces:

- 1.1. The location of each seat of each tier of seating, along with the number of occupants of each seating section.
- 1.2. The location and number of standees for each standee area.
- 1.3. The total number of occupants of each tier and of the assembly space.
- 1.4. The location and classification of all exits.
2. For safe areas:
  - 2.1. The furniture and equipment arrangement and location.
  - 2.2. The number of occupants to be accommodated.
3. For stage areas:
  - 3.1. The maximum number of occupants, including audience seating on the stage.
  - 3.2. Any conditions limiting the use of the stage area.
  - 3.3. The location of all exits.

These plans shall not be smaller in size than required for  $\frac{1}{8}$ -inch scale plans.

#### 1028.2 Assembly with occupant load greater than 300.

Buildings or spaces occupied by Group A that have an occupant load of greater than 300 shall be provided with a main exit. Such main exit shall be of sufficient width to accommodate not less than one-half of the occupant load, but such width shall not be less than the total required width of all means of egress leading to the exit. Where the main use or dominant occupancy of the building is classified as Group A, the main exit shall front on at least one street or an unoccupied space of not less than 10 feet (3048 mm) in width that adjoins a street or public way. Other additional exits shall provide an egress capacity for at least one-half of the total occupant load served by that level and comply with Section 1015.2.

**Exception:** In assembly occupancies where there is no well-defined main exit or where multiple main exits are provided, exits shall be permitted to be distributed around the perimeter of the building provided that the total width of egress is not less than 100 percent of the required width.

#### 1028.3 Reserved.

**1028.4 Foyers and lobbies.** In Group A-1 occupancies, where persons are admitted to the building at times when seats are not available, such persons shall be allowed to wait in a lobby or similar space, provided such lobby or similar space shall not encroach upon the required clear width of the means of egress. Such foyer, if not directly connected to a public street by all the main entrances or exits, shall have a straight and unobstructed corridor or path of travel to every such main entrance or exit.

**1028.5 Interior balcony and gallery means of egress.** For balconies, galleries or press boxes having a seating capacity of 50 or more located in Group A occupancies, at least two

means of egress shall be provided, with one from each side of every balcony, gallery, or press box and at least one leading directly to an exit.

**1028.5.1 Enclosure of openings.** Interior stairways and other vertical openings shall be enclosed in an exit enclosure as provided in Section 1022.1, except that stairways are permitted to be open between the balcony, gallery or press box and the main assembly floor in occupancies such as theaters, places of religious worship, auditoriums and sports facilities. At least one accessible means of egress is required from a balcony, gallery or press box level containing accessible seating locations in accordance with Section 1007.3 or 1007.4.

**1028.6 Width of means of egress for assembly.** The clear width of aisles and other means of egress shall comply with Section 1028.6.1 where smoke-protected seating is not provided and with Section 1028.6.2 or 1028.6.3 where smoke-protected seating is provided. The clear width shall be measured to walls, edges of seating and tread edges except for permitted projections.

**1028.6.1 Without smoke protection.** The clear width of aisles and other means of egress shall provide sufficient capacity in accordance with all of the following, as applicable:

1. At least 0.3 inch (7.6 mm) of width for each occupant served shall be provided on stairs having riser heights 7 inches (178 mm) or less and tread depths 11 inches (279 mm) or greater, measured horizontally between tread nosing.
2. At least 0.005 inch (0.127 mm) of additional stair width for each occupant shall be provided for each 0.10 inch (2.5 mm) of riser height above 7 inches (178 mm).
3. Where egress requires stair descent, at least 0.075 inch (1.9 mm) of additional width for each occupant shall be provided on those portions of stair width having no handrail within a horizontal distance of 30 inches (762 mm).
4. Ramped means of egress, where slopes are steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have at least 0.22 inch (5.6 mm) of clear width for each occupant served. Level or ramped means of egress, where slopes are not steeper than one unit vertical in 12 units horizontal (8-percent slope), shall have at least 0.20 inch (5.1 mm) of clear width for each occupant served.

**1028.6.2 Smoke-protected seating.** The clear width of aisles and other means of egress for smoke-protected assembly seating shall not be less than the occupant load served by the egress element multiplied by the appropriate factor in Table 1028.6.2. The total number of seats specified shall be those within the space and exposed to the same smoke-protected environment. Interpolation is permitted between the specific values shown. A life safety evaluation, complying with NFPA 101, shall be

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For SI: 1 inch = 25.4 mm.

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**TABLE 1028.7  
TRAVEL DISTANCE**

OCCUPANCY	NON-SPRINKLERED		SPRINKLERED	
	PRIMARY	SECONDARY	PRIMARY	SECONDARY
A-1, A-2, A-3, A-4	100	150	150	250
A-5	200	300	200	300

**1028.8 Common path of travel.** The common path of travel shall not exceed 30 feet (9144 mm) from any seat to a point where an occupant has a choice of two paths of egress travel to two exits.

**Exceptions:**

1. For areas, such as box seats, galleries or balconies, serving not more than 50 occupants, the common path of travel shall not exceed 75 feet (22 860 mm).
2. For smoke-protected assembly seating, the common path of travel shall not exceed 50 feet (15 240 mm).

**1028.9 Assembly aisles are required.** Every occupied portion of any occupancy in Group A that contains seats, tables, displays, similar fixtures or equipment shall be provided with aisles leading to exits or exit access doorways in accordance with this section. Aisle accessways for tables and seating shall comply with Section 1017.4.

**1028.9.1 Minimum aisle width.** The minimum clear width of aisles shall be as shown:

1. Forty-eight inches (1219 mm) for aisle stairs having seating on each side.
- Exception:** Thirty-six inches (914 mm) where the aisle does not serve more than 50 seats.
2. Thirty-six inches (914 mm) for aisle stairs having seating on only one side.
3. Twenty-three inches (584 mm) between an aisle stair handrail or guard and seating where the aisle is subdivided by a handrail.
4. Forty-two inches (1067 mm) for level or ramped aisles having seating on both sides.

**Exception:** Thirty-six inches (914 mm) where the aisle does not serve more than 50 seats.

5. Thirty-six inches (914 mm) for level or ramped aisles having seating on only one side.

**1028.9.2 Aisle width.** The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle. The catchment area served by an aisle is that portion of the total space that is served by that section of the aisle. In establishing catchment areas, the assumption shall be made that there is a balanced use of all means of egress,

with the number of persons in proportion to egress capacity.

**1028.9.3 Converging aisles.** Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall not be less than the combined required capacity of the converging aisles.

**1028.9.4 Uniform width.** Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

**1028.9.5 Assembly aisle termination.** Each end of an aisle shall terminate at cross aisle, foyer, doorway, vomitory or concourse having access to an exit.

**Exceptions:**

1. Dead-end aisles shall not be greater than 20 feet (6096 mm) in length.
2. For smoke-protected assembly seating, the dead-end aisle length of vertical aisles shall not exceed a distance of 50 feet (15 240 mm).

**1028.9.6 Assembly aisle obstructions.** There shall be no obstructions in the required width of aisles except for handrails as provided in Section 1028.13.

**†1028.10 Clear width of aisle accessways serving seating.**

Where seating rows have 14 or fewer seats, the minimum clear aisle accessway width shall not be less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm in the used position.

**Exception:** For seats with folding tablet arms, row spacing is permitted to be determined with the tablet arm in the stored position where the tablet arm when raised manually to vertical position in one motion automatically returns to the stored position by force of gravity.

**1028.10.1 Dual access.** For rows of seating served by aisles or doorways at both ends, there shall not be more than 100 seats per row. The minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.3 inch (7.6 mm) for every additional seat beyond 14 seats, but the minimum clear width is not required to exceed 22 inches (559 mm).

**Exception:** For smoke-protected assembly seating, the row length limits for a 12-inch-wide (305 mm) aisle accessway, beyond which the aisle accessway minimum clear width shall be increased, are in Table 1028.10.1.



**TABLE 1028.10.1**  
**SMOKE-PROTECTED ASSEMBLY AISLE ACCESSWAYS**

NYC	TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY OCCUPANCY	MAXIMUM NUMBER OF SEATS PER ROW PERMITTED TO HAVE A MINIMUM 12-INCH CLEAR WIDTH AISLE ACCESSWAY
		Aisle or doorway at both ends of row
NYC	Less than 4,000	14
NYC	4,000	15
NYC	7,000	16
NYC	10,000	7
NYC	13,000	18
NYC	16,000	19
NYC	19,000	20
NYC	22,000 and greater	21

For SI: 1 inch = 25.4 mm.

**1028.10.2 Single access.** For rows of seating served by an aisle or doorway at only one end of the row, the minimum clear width of 12 inches (305 mm) between rows shall be provided. Not more than eight chairs shall be provided in such row of seating.

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**1028.11 Assembly aisle walking surfaces.** Aisles with a slope not exceeding one unit vertical in eight units horizontal (12.5-percent slope) shall consist of a ramp having a slip-resistant walking surface. Aisles with a slope exceeding one unit vertical in eight units horizontal (12.5-percent slope) shall consist of a series of risers and treads that extends across the full width of aisles and complies with Sections 1028.11.1 through 1028.11.4.

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**1028.11.1 Treads.** Tread depths shall be a minimum of 11 inches (279 mm) and shall have dimensional uniformity.

**Exception:** The tolerance between adjacent treads shall not exceed 0.188 inch (4.8 mm).

**1028.11.2 Risers.** Where the gradient of aisle stairs is to be the same as the gradient of adjoining seating areas, the riser height shall not be less than 4 inches (102 mm) nor more than 8 inches (203 mm) and shall be uniform within each flight.

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**Exception:** Riser height nonuniformity shall be limited to the extent necessitated by changes in the gradient of the adjoining seating area to maintain adequate sightlines. Where nonuniformities exceed 0.188 inch (4.8 mm) between adjacent risers, the exact location of such nonuniformities shall be indicated with a distinctive marking stripe on each tread at the nosing or leading edge adjacent to the nonuniform risers. Such stripe shall be a minimum of 1 inch (25 mm), and a maximum of 2 inches (51 mm), wide. The edge marking stripe shall be distinctively different from the contrasting marking stripe.

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**1028.11.3 Tread contrasting marking stripe.** A contrasting marking stripe shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such

stripe shall be a minimum of 1 inch (25 mm), and a maximum of 2 inches (51 mm), wide.

**Exception:** The contrasting marking stripe is permitted to be omitted where tread surfaces are such that the location of each tread is readily apparent when viewed in descent.

**1028.11.4 Step lighting.** Each step shall have a steplight.

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**1028.11.5 Aisle illumination.** Aisles and cross aisles shall be illuminated in accordance with Section 1006.2.

**1028.12 Seat stability.** In places of assembly, the seats shall be securely fastened to the floor.

**Exceptions:**

1. In places of assembly or portions thereof without ramped or tiered floors for seating and with 200 or fewer seats, the seats shall not be required to be fastened to the floor, provided that the seating area has a minimum net floor area of 12 square feet (1.11 m<sup>2</sup>) per person.
2. In places of assembly or portions thereof with seating at tables and without ramped or tiered floors for seating, the seats shall not be required to be fastened to the floor.
3. In places of assembly or portions thereof without ramped or tiered floors for seating and with greater than 200 seats, the seats shall be securely fastened to the floor, or all seats in a row shall be fastened together with a maximum of 12 seats between aisles.
4. In places of assembly where flexibility of the seating arrangement is an integral part of the design and function of the space and seating is on tiered levels, a maximum of 200 seats shall not be required to be fastened to the floor, provided that the seating area has a minimum net floor area of 12 square feet (1.11 m<sup>2</sup>) per person.
5. Groups of seats within a place of assembly separated from other seating by railings, guards, partial height walls or similar barriers with level floors and having no more than 14 seats per group shall not be required to be fastened to the floor.
6. Seats intended for musicians or other performers and separated by railings, guards, partial height walls or similar barriers shall not be required to be fastened to the floor.

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**1028.13 Handrails.** Ramped aisles having a slope exceeding one unit vertical in 15 units horizontal (6.7-percent slope) and aisle stairs shall be provided with handrails located either at the side or within the aisle width.

**Exceptions:**

1. Handrails are not required for ramped aisles having a gradient no greater than one unit vertical in eight units horizontal (12.5-percent slope) and seating on both sides.



- 2 hour fire-resistance rating. Such safe areas shall serve as transition areas in the line and direction of exit travel. They shall serve for normal entry to the assembly space and may be used as corridors, lobbies or lounges.
- No room or space classified in Occupancy Group H, S-1, F-1 or F-2 shall open upon a safe area.
  - Safe areas shall be at a level not more than 6 feet (1829 mm) above or below the level at which egress is made from the assembly space.
  - Ventilating systems for safe areas shall not be connected to systems serving any other spaces, unless separated from such systems by fire/smoke dampers actuated by smoke detectors.
  - Collecting safe areas. Places of assembly having more than one assembly space may have a collecting safe area that receives the occupant load discharged into it by other safe areas. Collecting safe areas shall be located within 6 feet (1829 mm) above or below the assembly space nearest to grade.
  - Occupant load. The occupant load of a safe area shall be the aggregate occupant load of all exit openings discharging directly into it. The occupant load of a collecting safe area shall be the aggregate occupant load of all exit openings discharging directly into it, plus 50 percent of the occupant load of other safe areas discharging into it.
  - Dimensions. The clear unobstructed floor area of each safe area shall be sufficient to accommodate the total occupant load of the safe area on the basis of 3 square feet (0.28 m<sup>2</sup>) per person, not including space occupied by furniture or equipment. The minimum dimension of such unobstructed space shall be 8 feet (2438 mm). The width of the unobstructed space shall be measured at right angles to the direction of travel to an exit and shall not be less than required for the occupant load. The height of safe areas shall be at least 8 feet (2438 mm) at all points.
  - Safe areas near grade. When a safe area provides egress to an open exterior space, either directly or through a vestibule, the safe area need not provide the floor area required by this section when the level of discharge from the safe area to the open exterior space is not more than 4 feet (1219 mm) above or below the grade of the open exterior space.

**1028.17.3.1 Unenclosed vertical exits.** Vertical exits leading directly from one safe area to another, or leading from a safe area directly to an open exterior space, need not be enclosed.

**1028.17.3.2 Safe area lighting.** In addition to requirements of Section 1006, safe areas shall be artificially lighted by electrical means at all times during occupancy of a place of assembly so as to provide illumination of at least 5 foot-candles (54 lux) at the level of the floor and on the surface of all stairs, steps, ramps, and escalators within the safe area.

**1028.17.4 Open exterior space.** The following provisions shall apply when an open exterior space is used as an exit discharge:

- Capacity.** Open exterior spaces shall be adequate in width and area to accommodate the accumulated occupant load of all exits discharging into them on the basis of 2 square feet (0.19 m<sup>2</sup>) per person.
- Minimum dimensions.** The minimum dimension of open exterior spaces shall be 20 feet (6096 mm), except that when the principal entrance to the place of assembly is from an open exterior space, the minimum dimension of this space shall be 30 feet (9144 mm). No open exterior space shall have less than 400 square feet (37 m<sup>2</sup>) of floor area, and floor area shall be measured exclusive of the following:
  - The area immediately outside any exit door from the place of assembly for a distance perpendicular to the exit doors of 10 feet (3048 mm) for the full width of the exit opening.
  - The area of steps, platforms, stairs, or ramps within or leading to or from the space.
  - The area of obstructions such as shrubs, trees, fixed furniture, signs, sculptures, pools, and similar obstructions to occupancy or exit travel.
- Above or below grade.** When an open exterior space is more than 15 feet (4572 mm) above or below the grade of the street or public space to which it discharges, its required area shall be increased by one-third.
- Egress from open exterior spaces.** Exterior exit passageways, ramps, or steps leading from open exterior spaces shall be not less in width than required for the occupant load of all exits discharging into the open exterior space. The width of such exit passageways shall be based on the capacities listed in Section 1005.1, but in no case less than 10 feet (3048 mm).
- Open exterior spaces.** Yards or courts which serve as open exterior spaces shall be artificially lighted by electrical means at all times between sunset and sunrise during occupancy of a place of assembly so as to provide illumination of at least 5 foot-candles (54 lux) at the level of the floor over at least the required area.

## SECTION BC 1029 EMERGENCY ESCAPE AND RESCUE

**1029.1 General.** In addition to the means of egress required by this chapter, provisions shall be made for emergency escape and rescue in Group R and Group I-1 occupancies. Sleeping rooms below the fourth story above grade plane and below-grade stories shall have at least one exterior emergency escape and rescue opening in accordance with this section. Where below-grade stories contain one or more sleeping rooms, emergency escape and rescue openings shall be required in each sleeping room, but shall not be required



**NYC** in adjoining areas of such below-grade story. Such opening shall open directly into a public way or to a yard or court that opens to a public way.

**Exceptions:**

- NYC** 1. Buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 or 903.3.1.2.
- NYC** 2. Sleeping rooms provided with a door to a fire-resistance-rated corridor having access to two remote exits in opposite directions.
- ⇒ 3. The emergency escape and rescue opening is permitted to open onto a balcony within an atrium in accordance with the requirements of Section 404, provided the balcony provides access to an exit and the dwelling unit or sleeping unit has a means of egress that is not open to the atrium.
- ⇒ 4. High-rise buildings in accordance with Section 403.
- NYC** 5. Emergency escape and rescue openings are not required from below-grade stories or sleeping rooms that have an exit door or exit access door that opens directly into a public way or to a yard, court or exterior exit balcony that opens to a public way.
- NYC** 6. Below-grade stories without habitable spaces and having no more than 200 square feet (18.6 m<sup>2</sup>) in floor area shall not be required to have emergency escape windows.

**NYC** **1029.2 Minimum size.** Emergency escape and rescue openings shall have a minimum net clear opening of 6 square feet (0.56 m<sup>2</sup>).

**Exception:** The minimum net clear opening for emergency escape and rescue grade-floor openings shall be 5 square feet (0.46 m<sup>2</sup>) unless such opening is required for natural ventilation in accordance with Chapter 12.

**NYC** **1029.2.1 Minimum dimensions.** The net clear opening height dimension shall not be less than 30 inches (762 mm). The net clear opening width dimension shall not be less than 24 inches (610 mm). The final dimensions shall result in a net clear opening area as required above. The net clear opening dimensions shall be the result of normal operation of the opening.

**NYC** **1029.3 Maximum height from floor.** Emergency escape and rescue openings shall have the bottom of the clear opening not greater than 36 inches (914 mm) measured from the floor.

**NYC** **1029.4 Operational constraints.** Emergency escape and rescue openings shall be operational from the inside of the room without the use of keys or tools in accordance with the provisions of Chapter 10 of the *New York City Fire Code*.

**1029.5 Window wells.** An emergency escape and rescue opening with a finished sill height below the adjacent ground level shall be provided with a window well in accordance with Sections 1029.5.1 and 1029.5.2.

**1029.5.1 Minimum size.** The minimum horizontal area of the window well shall be 9 square feet (0.84 m<sup>2</sup>), with a minimum dimension of 36 inches (914 mm). The area of

the window well shall allow the emergency escape and rescue opening to be fully opened.

**1029.5.2 Ladders or steps.** Window wells with a vertical depth of more than 44 inches (1118 mm) shall be equipped with an approved permanently affixed ladder or steps. Ladders or rungs shall have an inside width of at least 12 inches (305 mm), shall project at least 3 inches (76 mm) from the wall and shall be spaced not more than 18 inches (457 mm) on center (o.c.) vertically for the full height of the window well. The ladder or steps shall not encroach into the required dimensions of the window well by more than 6 inches (152 mm). The ladder or steps shall not be obstructed by the emergency escape and rescue opening. Ladders or steps required by this section are exempt from the stairway requirements of Section 1009.

## SECTION BC 1030 SIGNAGE

**1030.1 Signage.** Signage shall be provided in accordance with this section and the rules of the department.

**1030.2 Exit signs.** Exits signs shall be provided in accordance with Section 1011.

**1030.3 Stairway and elevator identification signs.** Stairway floor number and stairway identification signs shall be provided in accordance with Section 1022.8. Elevator identification and emergency signs shall be provided in accordance with Section 3002.3.

**1030.4 Door signs.** For the following buildings, signs shall be posted and maintained on exit stair doors in accordance with this section:

1. Buildings or portions thereof occupied by Group B or arranged to be occupied by more than 100 persons above or below the street level or more than 500 persons in the entire building.
2. High-rise buildings subject to Section 403.
3. Buildings where any stair side door is locked pursuant to Section 1008.1.9.10.

**Exception:** Signs shall not be required on exit stair doors opening directly to dwelling or sleeping units in occupancy Group R where permitted by Section 1014.4.

**1030.4.1 Occupied side.** Where reentry is not provided from a stair to every floor, a sign that reads, "NO REENTRY FROM THIS STAIR" shall be posted on the occupied side of the stair door at every floor.

**1030.4.2 Stair side.** On the stair side, signs shall be posted and maintained at all stair doors at every floor. Such signs shall be either:

1. **Reentry.** Where reentry is provided, a sign shall read, "REENTRY ON THIS FLOOR."
2. **No reentry.** Where reentry is not provided on that floor, the sign shall read:
  - 2.1. "NO REENTRY"; where reentry is not provided on any floor;



- 1030.4.3 Graphics.** The lettering and numerals of the signs shall be at least 1/2 inch (12.7 mm) high of bold type. The lettering and background shall be contrasting colors and the signs shall be securely attached approximately 5 feet (1524 mm) above the floor. The signs may be either independent or combined with floor and stairway identification signs.

1. **Reentry.** Where a reentry door is recessed, a supplementary sign complying with Section 1030.4.3, except that the lettering and numerals shall be at least 1 inch (25 mm) high, shall be securely attached on the wall of the landing and shall be readily visible to the evacuee on the stairs indicating the location of such recessed reentry door.
2. **No reentry.** Where there is no reentry from the stair, an additional sign complying with Subdivision 2 of Sections 1030.4.2 and 1030.4.3, except that the lettering and numerals shall be at least 1 inch (25 mm) high, shall be securely attached at the beginning of the descent into such portion of the stair on the wall of the landing and shall be readily visible to the evacuee on the stairs.

**1030.7 Capacity sign.** Occupant load signs shall be provided in accordance with Section 1004.3.

**1030.9 Delayed egress locks.** Doors equipped with delayed egress shall be provided with signs in accordance with Section 1008.1.9.7.

**1030.12 Materials for signs.** Signs required by this section shall be of metal or other durable material.

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# CHAPTER 11

## ACCESSIBILITY

### SECTION BC 1101 GENERAL

**1101.1 Scope.** The provisions of this chapter and Appendices E, N and P shall control the design and construction of facilities for accessibility to persons with physical disabilities.

**1101.2 Design.** Buildings and facilities shall be designed and constructed to be accessible in accordance with this code and ICC A117.1.

**1101.3 Special provisions for prior code buildings.** The provisions of this chapter shall apply to alterations, including minor alterations but excluding ordinary repairs, and changes of use or occupancy to prior code buildings in accordance with Sections† 1101.3.1 through 1101.3.5.

**Exception:** The provisions of this chapter are not applicable to:

1. Ordinary repairs.
2. R-3 occupancies in buildings with first occupancy on or before March 13, 1991.
3. R-3 occupancies in buildings with first occupancy after March 13, 1991, and originally constructed in a single structure with fewer than four‡ dwelling or sleeping units.

**1101.3.1 Requirements based on change of occupancy or how a space is used.** Accessible features and construction governed by this chapter shall be provided:

1. To the entire building, as if the building were hereafter erected, where a change is made in the main use or dominant occupancy of such building.
2. Throughout a space, including the immediate entrance(s) thereto, where an alteration is made that is considered either (i) a change in occupancy classification of such space in accordance with this code, or (ii) a change in the zoning use group of such space in accordance with the *New York City Zoning Resolution*.
- 2.1. ‡Entrances within 18 inches (457.2 mm)‡ of the sidewalk. Where the floor elevation of a space is within 18 inches (457.2 mm) of the sidewalk, and the immediate entrance(s) to such space provides direct access to the sidewalk, such immediate entrance(s) shall be provided with an accessible route to the sidewalk. Where the immediate entrance(s) to such space are only through an adjacent space, such as a building lobby, such space shall be provided with an accessible route, through the adjacent space, to the sidewalk.
3. To provide an accessible route to a space, including rooftops, where prior to a change in use of occu-

pancy or in how such space is used, this chapter would not have required an accessible route for new construction.

**1101.3.2 Requirements based on value of alterations.** Accessible features and construction governed by this chapter shall be provided:

1. To the entire building undergoing alterations, as if the building were hereafter erected, where the value of alterations exceeds 50 percent of the value of the existing building.
2. To the portion of the building being altered, to the extent of the alteration, including minor alterations but excluding ordinary repairs, where the value of the alteration does not exceed 50 percent of the value of the existing building.
- 2.1 Within buildings with first occupancies on or before March 13, 1991, bathrooms and powder rooms located in dwelling units in such portion being altered shall be permitted to comply with prototype layouts established by rule.

**1101.3.3 Directional accessibility signage.** Directional signage shall be provided in accordance with Section 1110.2 at or in close proximity to inaccessible building entrances, inaccessible public toilets and bathing facilities, and elevators not serving an accessible route indicating the route to the nearest like accessible element where such accessible element is provided, such that a person with disabilities will not be required to retrace the approach route from the inaccessible element.

**1101.3.4 Identifying accessibility signage.** Identifying accessibility signage shall be provided in accordance with Item 7 of Section 1110.1 at accessible building entrances where not all entrances are accessible.

**1101.3.5 Waiver of requirements.** The commissioner may waive the requirements of this chapter for the alteration of existing buildings, provided, however, that such waiver would not significantly adversely affect provisions for health, safety and security and that equally safe and proper alternatives are prescribed and, further, that such waiver is based upon a specific finding that strict compliance with the requirement:

1. Would create an undue economic burden;
2. Would not achieve its intended objective;
3. Would be physically or legally impossible;
4. Would be unnecessary in light of alternatives which ensure the achievement of the intended objective or which, without a loss in the level of safety, achieve the intended objective more efficiently, effectively or economically; or

5. Would entail a change so slight as to produce a negligible additional benefit consonant with the purposes of this chapter.

**1101.3.5.1 Application process.** Each application for a waiver shall be made to the commissioner in writing, setting forth each requirement sought to be waived and the specific reason or reasons therefore. The commissioner shall determine, under all of the circumstances presented by such application, which of such requirements may appropriately be waived. The commissioner shall render such determination in a writing, which shall set forth in detail, the commissioner's findings and conclusions with respect to each requirement sought to be waived. A copy of such written determination shall be forwarded to the applicant. Such written determination shall be filed with the department and shall be available for public inspection.

**1101.3.5.2 Waiver recommendation.** The Mayor's Office for People with Disabilities or its successor agency shall be consulted by and shall advise the commissioner concerning each application for a waiver under Section 1101.3.5.

## SECTION BC 1102 DEFINITIONS

**1102.1 Definitions.** The following words and terms shall, for the purposes of this chapter, applicable appendices and as used elsewhere in this code, have the meanings shown herein:

**ACCESSIBLE.** A site, building, facility or portion thereof that complies with this chapter.

**ACCESSIBLE ROUTE.** A continuous, unobstructed path that complies with this chapter.

**ACCESSIBLE UNIT.** A dwelling unit or sleeping unit that complies with this code and the provisions for Accessible units in ICC A117.1.

**CIRCULATION PATH.** An exterior or interior way of passage from one place to another for pedestrian travel.

**COMMON USE.** Interior or exterior circulation paths, rooms, spaces or elements that are made available for the shared use of two or more people but are not for public use.

**DETECTABLE WARNING.** A standardized surface feature built in or applied to walking surfaces or other elements to warn visually impaired persons of hazards on a circulation path.

**DWELLING UNIT (ACCESSIBILITY).** For the purposes of Chapter 11 and applicable appendices: A single unit providing complete, independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

**DWELLING UNIT OR SLEEPING UNIT, MULTISTORY.** See "Multistory unit."

**DWELLING UNIT OR SLEEPING UNIT, TYPE B.** See "Type B unit."

**EMPLOYEE WORK AREA.** All or any portion of a space used only by employees and only for work. Corridors, toilet rooms, kitchenettes and break rooms are not employee work areas.

**FACILITY.** All or any portion of buildings, structure, site improvements, elements and pedestrian or vehicular routes located on a site.

**INTENDED TO BE OCCUPIED AS A RESIDENCE.** This refers to a dwelling unit or sleeping unit that can or will be used all or part of the time as the occupant's place of abode.

**MULTILEVEL ASSEMBLY SEATING.** Seating that is arranged in distinct levels where each level is comprised of either multiple rows, or single row of box seats accessed from a separate level.

**MULTISTORY UNIT.** A dwelling unit or sleeping unit with habitable space located on more than one story.

**PUBLIC ENTRANCE.** An entrance that is not a service entrance.

**PUBLIC-USE AREAS.** Interior or exterior rooms or spaces that are made available to the general public.

**RESTRICTED ENTRANCE.** An entrance that is made available for public use but on a controlled basis, and that is not a service entrance.

**SELF-SERVICE STORAGE FACILITY.** Real property designed and used for the purpose of renting or leasing individual storage spaces to customers for the purpose of storing and removing personal property on a self-service basis.

**SERVICES.** Includes but is not limited to toilet rooms, drinking fountains, public telephones and food.

**SERVICE ENTRANCE.** An entrance solely for delivery of goods or services.

**SITE.** A parcel of land bounded by a lot line or a designated portion of a public right-of-way.

**SLEEPING UNIT (ACCESSIBILITY).** For the purposes of Chapter 11 and applicable appendices: A room or space in which people sleep, which can also include permanent provisions for living, eating, and either sanitation or kitchen facilities but not both. Such rooms and spaces that are also part of a dwelling unit are not sleeping units.

**TYPE B UNIT.** A dwelling unit or sleeping unit designed and constructed for accessibility in accordance with this code and the provisions for Type B units in ICC A117.1, consistent with the design and construction requirements of the federal *Fair Housing Act*.

**TYPE B+NYC UNIT.** A dwelling unit or sleeping unit designed and constructed for accessibility in accordance with this code, Section 1004 (Type B Units) of ICC A117.1 as modified by Sections 1107.2.1 through 1107.2.8, and Appendix P of this code.

**VALUE (OF EXISTING BUILDING OR SPACE).** See Section 202.

**VALUE (OF ALTERATIONS, TO DETERMINE REQUIRED ACCESSIBILITY).** The value of alterations

NYC shall be determined by adding the estimated cost of the proposed alteration, including minor alterations but excluding ordinary repairs, computed as of the time of submitting the application for construction document approval, or, where no permit is required, computed at the time of the work, to the actual cost of any and all alterations and minor alterations made in the preceding 12-month period. Where the alteration includes an enlargement, the value of the alteration shall include the cost of the enlargement.

**WHEELCHAIR SPACE.** A space for a single wheelchair and its occupant.

## SECTION BC 1103 SCOPING REQUIREMENTS

**1103.1 Where required.** Sites, buildings, structures, facilities, elements and spaces, temporary or permanent, shall be accessible to persons with physical disabilities.

**1103.2 General exceptions.** Sites, buildings, structures, facilities, elements and spaces shall be exempt from this chapter to the extent specified in this section.

**1103.2.1 Specific requirements.** Accessibility is not required in buildings and facilities, or portions thereof, to the extent permitted by Sections 1104 through 1110.

**1103.2.2 Prior code buildings.** Prior code buildings shall comply with Section 1101.3.

**1103.2.3 Employee work areas.** All or any portion of a space used exclusively by employees and only for work shall be required to comply only with Section 1103.2.3. However, common use circulation paths, located within employee work areas shall also comply with Section 1104.3.1.

**1103.2.3.1 Employee work areas and work stations.** Spaces and elements within employee work areas shall comply with Sections 907.5.2.3.2, 1007 and 1104.3.1 and shall be designed and constructed so that individuals with disabilities can approach, enter and exit the work area. In addition, at least one and not less than five percent of seating, tables and/or work stations, if provided, within employee work areas shall comply with applicable sections of ICC A117.1.

**1103.2.3.2 Elevated employee work areas.** Where the elevation is critical to the proper work operations, work areas or portions of work areas, other than raised courtroom stations, that are less than 300 square feet (30 m<sup>2</sup>) in area and elevated 7 inches (178 mm) or more above the ground or finish floor shall be exempt from all requirements.

**1103.2.4 Detached dwellings.** Detached one and two-family dwellings and their accessory structures, and their associated sites and facilities are not required to be accessible.

**1103.2.5 Utility buildings.** Occupancies in Group U are exempt from the requirements of this chapter other than the following:

1. In agricultural buildings and livestock shelters, access is required to paved work areas and areas open to the general public.

2. Green houses and stables open to the public.
3. Private garages or carports that contain required accessible parking.

**1103.2.6 Construction sites.** Structures, sites and equipment directly associated with the actual processes of construction including, but not limited to, scaffolding, bridging, materials hoists, materials storage or construction trailers are not required to be accessible.

**1103.2.7 Raised areas.** Raised areas used for purposes of security, life safety or fire safety including, but not limited to, observation galleries, prison guard towers, fire towers or lifeguard stands are not required to be accessible or to be on an accessible route.

**1103.2.8 Limited access spaces.** Nonoccupiable spaces accessed only by ladders, catwalks, crawl spaces, freight elevators that are not part of an accessible route, or very narrow passageways are not required to be accessible.

**1103.2.9 Equipment spaces.** Spaces frequented only by personnel for maintenance, repair or monitoring of equipment are not required to be accessible. Such spaces include, but are not limited to, elevator pits, elevator pent-houses, mechanical, electrical or communications equipment rooms, piping or equipment catwalks, water or sewerage treatment pump rooms and stations, electrical substations and transformer vaults, and highway and tunnel utility facilities.

**1103.2.10 Nongrade single-occupant structures.** Single-occupant structures that are accessed only by passageways below grade or above grade including, but not limited to, toll booths that are accessed only by bridges or underground tunnels, are not required to be accessible.

**1103.2.11 Reserved.**

**1103.2.12 Reserved.**

**1103.2.13 Reserved.**

**1103.2.14 Detention and correctional facilities.** In detention and correctional facilities, common use areas that are used only by inmates or detainees and security personnel, and that do not serve holding cells or housing cells required to be accessible pursuant to Section 1107.5.5, are not required to be accessible or to be on an accessible route.

**1103.2.15 Walk-in coolers and freezers.** Walk-in coolers and freezers intended for employee use only are not required to be accessible.

## SECTION BC 1104 ACCESSIBLE ROUTE

**1104.1 Site arrival points.** Accessible routes within the site shall be provided from public transportation stops, accessible parking, accessible passenger loading zones, and public streets or sidewalks to the accessible building entrance served.

**1104.2 Within a site.** At least one accessible route shall connect accessible buildings, accessible facilities, accessible



NYC elements and accessible spaces that are on the same site and shall comply with Section 1104.5.

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**1104.3 Connected spaces.** When a building, or portion of a building, is required to be accessible, an accessible route shall be provided to each portion of the building, to accessible building entrances connecting accessible pedestrian walkways and the public way.

**Exceptions:**

- NYC 1. In assembly areas with seating, an accessible route shall not be required to serve levels where wheelchair spaces are not provided as permitted by other sections of this chapter.
- NYC 2. Accessible routes shall not be required where multiple levels are not required to be connected by an accessible route as permitted by Section 1104.4.
- NYC 3. In Group I-2 facilities, doors to sleeping units shall be exempted from the requirements for maneuvering clearance at the room side provided the door is a minimum of 44 inches (1118 mm) in width.

NYC **1104.3.1 Circulation paths within employee work areas.** Common use circulation paths within employee work areas shall be accessible routes.

NYC **Exceptions:** The following exceptions apply only to the common use circulation paths within an employee work area and are not intended to remove the requirement of Section 1103.2.3 that employee work areas be designed and constructed so that individuals with disabilities can approach, enter and exit the employee work area.

- NYC 1. Common use circulation paths, located within employee work areas less than 300 square feet (27.9 m<sup>2</sup>) in size, and defined by permanently installed partitions, counters, casework or furnishings not serving accessible employee work stations that are required in Section 1103.2.3.1, shall not be required to be accessible routes.
- NYC 2. Common use circulation paths, located within employee work areas, that are an integral component of equipment, shall not be required to be accessible routes.

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**1104.3.2 Press boxes.** Press boxes in assembly areas shall be on an accessible route.

**Exceptions:**

- NYC 1. An accessible route shall not be required to press boxes in bleachers that have points of entry at only one level, provided that the aggregate area of all press boxes is 500 square feet (46.5 m<sup>2</sup>) maximum.
- NYC 2. An accessible route shall not be required to free-standing press boxes that are elevated above grade 12 feet (3658 mm) minimum provided that the aggregate area of all press boxes is 500 square feet (46.5 m<sup>2</sup>) maximum.

**1104.4 Multilevel buildings and facilities.** At least one accessible route shall connect each accessible level, including mezzanines, in multilevel buildings and facilities.

**Exceptions:**

1. In nonresidential buildings, an accessible route is not required to levels and mezzanines above and below accessible levels where the aggregate area of all such levels and mezzanines that are not provided with accessible routes is not more than 2,500 square feet (232.3 m<sup>2</sup>). This exception shall not apply to:
- 1.1. Multiple tenant facilities of Group M occupancies containing five or more tenant spaces;
- 1.2. Levels containing offices of health care providers (Group B or I);
- 1.3. Passenger transportation facilities and airports (Group A-3 or B); or
- 1.4. Levels frequented by the public for assembly purposes other than levels where wheelchair spaces are not required to be provided as determined in accordance with Section 1108.2.4.†
- 1.5. Levels frequented by the public for government, public utility or health facility purposes.
2. Levels that do not contain accessible elements or other spaces as permitted by Sections 1107 or 1108 are not required to be served by an accessible route from an accessible level.
3. Where a two-story building or facility has one story with an occupant load of five or fewer persons that does not contain public use space, that story shall not be required to be connected by an accessible route to the story above or below.
4. Vertical access to elevated employee work stations within a courtroom is not required at the time of initial construction, provided a ramp, lift or elevator complying with ICC A117.1 can be installed without requiring reconfiguration or extension of the courtroom or extension of the electrical system.

The exemption of a level from accessible route requirements pursuant to the exceptions set forth in this section shall not be construed to automatically exempt such level from other accessibility provisions of this chapter including but not limited to requirements for accessible doors, toilets and level floors. Such other accessibility provisions remain applicable to such level specifically exempted by other sections of this code.

**1104.5 Location.** Accessible routes shall coincide with or be located in the same area as a general circulation path. Where the circulation path is interior, the accessible route shall also be interior. Where only one accessible route is provided, the accessible route shall not pass through kitchens, storage rooms, restrooms, closets or similar spaces.

**Exception:** A single accessible route is permitted to pass through a kitchen in an Accessible unit, Type B+NYC unit, or Type B unit.

**1104.6 Security barriers.** Security barriers including, but not limited to, security bollards and security check points shall not obstruct a required accessible route or accessible means of egress.

**Exception:** Where security barriers incorporate elements that cannot comply with these requirements, such as certain metal detectors, fluoroscopes or other similar devices, the accessible route shall be permitted to be provided adjacent to security screening devices. The accessible route shall permit persons with disabilities passing around security barriers to maintain visual contact with their personal items to the same extent provided others passing through the security barrier.

## SECTION BC 1105 ACCESSIBLE ENTRANCES

**1105.1 Public entrances.** In addition to accessible entrances required by Sections 1105.1.1 through 1105.1.6, all public entrances shall be accessible.

### Exceptions:

1. An accessible entrance is not required to areas that are not required to be accessible by this chapter or Appendix E.
2. Loading and service entrances that are not the only entrance to a building or a tenant space.
3. Revolving doors, revolving gates, or turnstiles shall not be required to be accessible provided that an accessible entrance is available adjacent to such revolving doors, revolving gates or turnstiles.

**1105.1.1 Parking garage entrances.** Where provided, direct access for pedestrians from parking structures to buildings or facility entrances shall be accessible.

**1105.1.2 Entrances from tunnels or elevated walkways.** Where direct access is provided for pedestrians from a pedestrian tunnel or elevated walkway to a building or facility, entrances from such access to the building or facility shall be accessible.

**1105.1.3 Restricted entrances.** Where restricted entrances are provided to a building or facility, all such restricted entrances shall be accessible.

**1105.1.4 Entrances for inmates and detainees.** Where entrances used only by inmates or detainees and security personnel are provided at judicial facilities, detention facilities or correctional facilities, all such entrances shall be accessible.

**1105.1.5 Service entrances.** If a service entrance is the only entrance to a building or a tenant space in a facility, that entrance shall be accessible.

**1105.1.6 Tenant spaces.** All entrances to tenant spaces that are required to be accessible shall be accessible entrances.

**1105.1.6.1 Dwelling units and sleeping units.** Doors and doorways at entrance(s) to Accessible units and Type B+NYC units, including hardware, shall comply with Section 404 (Doors and Doorways) of ICC

A117.1. Doors and doorways, including hardware, at entrance(s) to Type B units shall comply with Section 1003.5 (Doors and Doorways) of ICC A117.1.

### Exceptions:

1. An accessible entrance is not required to dwelling units and sleeping units that are not required to be Accessible units, Type B+NYC units, or Type B units.
2. Entrances to multistory dwelling or sleeping units in R-2 occupancy as provided in Section 1107.2.5 that are not on the primary entry story to the unit and are not part of the accessible route required in Exception 1 of Section 1107.2.5 shall not be required to be accessible.
3. In Group I-2 facilities, doors to sleeping units shall be exempted from the requirements for maneuvering clearance at the room side provided the door is a minimum of 44 inches (1118 mm) in width.

## SECTION BC 1106 PARKING AND PASSENGER LOADING FACILITIES

**1106.1 Required.** Where parking is provided, 5 percent of the total number of parking spaces provided for a facility, but not less than one parking space, shall be accessible parking spaces except as otherwise required by Sections 1106.2 through 1106.4. Van-accessible parking spaces shall be provided in accordance with Section 1106.5. Accessible parking spaces shall be designed and constructed in accordance with Section 502 (Parking Spaces) of ICC A117.1. Where more than one parking facility is provided on a site, the number of parking spaces required to be accessible shall be calculated separately for each parking facility. Where a determination of the minimum number of parking spaces results in a number containing a decimal of 0.5 or more, the next highest integer shall be used.

**Exception:** This section does not apply to parking spaces used exclusively for buses, trucks, other delivery vehicles, law enforcement vehicles or vehicular impound where lots accessed by the public are provided with an accessible passenger loading zone.

**1106.2 Groups R-2 and R-3.** Where parking is provided for occupancies in Groups R-2 and R-3, which are required to have Accessible, Type B+NYC, or Type B units, the number of accessible parking spaces shall be in compliance with Section 1106.1 and such number of accessible parking spaces shall be dispersed in accordance with Section 1106.6. Where parking is provided within or beneath a building, accessible parking spaces shall also be provided within or beneath the building.

**1106.2.1 Lease, rental, or assignment of spaces.** In a parking facility accessory to Occupancy Group R-2 or R-3 serving only the residents or employees of the management of such occupancy, or provided in compliance with Section 25-412 of the *New York City Zoning Resolution*, the accessible parking spaces in such facility may be leased, rented or assigned to a person without physical

disabilities on a no longer than month-to-month basis. Such leases, rentals, or assignments of the accessible parking spaces to persons without physical disabilities shall be on written condition that such spaces be relinquished immediately at the end of the term of such lease, rental, or assignment to a resident or employee of the management of such occupancy who is a person with physical disabilities.

**1106.3 Hospital outpatient facilities.** At least 10 percent, but not less than one, of patient and visitor parking spaces provided to serve hospital outpatient facilities shall be accessible.

**1106.4 Rehabilitation facilities and outpatient physical therapy facilities.** At least 20 percent, but not less than one, of the portion of patient and visitor parking spaces serving rehabilitation facilities specializing in treating conditions that affect mobility and outpatient physical therapy facilities shall be accessible.

**1106.5 Van spaces.** For every six or fraction of six accessible parking spaces, at least one space shall be a van-accessible parking space. Van-accessible parking spaces shall be designed and constructed in accordance with ICC A117.1, including Section 502 (Parking Spaces).

**Exception:** In Group R-2 and R-3 occupancies, van-accessible spaces located within private garages not exceeding 300 square feet (27.9 m<sup>2</sup>) shall be permitted to have vehicular routes, entrances, parking spaces and access aisles with a minimum vertical clearance of 7 feet (2134 mm).

**1106.6 Location.** Accessible parking spaces shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance. In parking facilities that do not serve a particular building, accessible parking spaces shall be located on the shortest route to an accessible pedestrian entrance to the parking facility. Where buildings have multiple accessible entrances with adjacent parking, accessible parking spaces shall be dispersed and located near the accessible entrances. In Occupancy Groups R-2 and R-3, at least one of each type of parking space shall be accessible.

#### Exceptions:

1. In multilevel parking structures, van-accessible parking spaces complying with Section 502 (Parking Spaces) of ICC A117.1 may be provided on one level.
2. Accessible parking spaces shall be permitted to be located in different parking facilities if substantially equivalent or greater accessibility is provided in terms of distance from an accessible entrance or entrances, parking fee and user convenience.
3. In an attended parking facility in which vehicles customarily are parked and later returned to their drivers by an attendant employed by the parking facility, accessible parking spaces need not be designated by a sign or lines if all of the following conditions are met:

- 3.1. Van-accessible parking spaces complying with Section 502 (Parking Spaces) of ICC A117.1 are provided;
  - 3.2. A passenger loading zone complying with Section 1106.7 is provided where an attendant shall take control of the vehicles. A vertical clearance of 98 inches (2489 mm) shall be permitted at such loading zone;
  - 3.3. At least one accessible parking space shall remain available unless all accessible parking spaces are occupied;
  - 3.4. The attendant shall park and retrieve all vehicles not equipped with special controls entering the facility in which a person with disabilities is either the driver or a passenger, provided accessible parking space is available;
  - 3.5. The attendant shall direct the drivers of vehicles equipped with special controls to accessible parking spaces. The attendant shall accompany such drivers to and from such space along an accessible route when they enter and exit the facility. If necessary, the accessible route and accessible parking space shall be created by the repositioning of vehicles parked previously by the attendant; and
  - 3.6. Each van-accessible parking space shall have two permanently and prominently posted signs. One shall include the International Symbol of Accessibility complying with Section 703.6.3.1 of ICC A117.1. The other sign shall note that vehicles parked in such spaces are subject to being moved by an attendant of the parking facility in order to accommodate a vehicle which cannot be accommodated in another accessible parking space. Such signs shall not be obstructed by a vehicle parked in the space.
4. Mechanical access parking garages shall comply with Section 1106.7.4.

**1106.7 Passenger loading zones.** Passenger loading zones shall be designed and constructed in accordance with ICC A117.1 including Section 503 (Passenger Loading Zones). Where there are curbs between the access aisle and the vehicle pull-up space, a curb ramp complying with ICC A117.1 including Section 406 (Curb Ramps) shall be provided.

**1106.7.1 Continuous loading zones.** Where passenger loading zones are provided, at least one accessible passenger loading zone shall be provided within each continuous 100 linear feet (30.4 m) of loading zone space, or fraction thereof, so that travel between accessible passenger loading zones will not exceed 100 linear feet (30.4 m).

**1106.7.2 Medical facilities.** A passenger loading zone shall be provided at an accessible entrance to licensed medical and long-term care facilities where people receive physical or medical treatment or care and where the period of stay exceeds 24 hours.



**1106.7.3 Valet parking.** A passenger loading zone shall be provided at valet parking services.

**1106.7.4 Mechanical access parking garages.** Mechanical access parking garages shall provide at least one passenger loading zone in compliance with Section 1106.7 at vehicle drop-off and vehicle pick-up areas.

## SECTION BC 1107 DWELLING UNITS AND SLEEPING UNITS

**1107.1 General.** In addition to the other requirements of this chapter, occupancies having dwelling units or sleeping units shall be provided with accessible features in accordance with this section.

**1107.2 Design.** Dwelling units and sleeping units which are required to be Accessible units, Type B+NYC units, or Type B units shall comply with this code including Appendix P where applicable, and the applicable provisions of Chapter 10 of ICC A117.1. In addition, Type B+NYC units shall comply with Sections 1107.2.1 through 1107.2.8. Units required to be Type B+NYC units or Type B units are permitted to be designed and constructed as Accessible units.

**1107.2.1 Type B+NYC unit doors and doorways.** Doors and doorways at the entrance(s) to Type B+NYC dwelling or sleeping units shall comply with Section 1105.1.6. All other doors and doorways within the dwelling or sleeping unit meant for human passage shall comply with Section 1003.5 (Doors and Doorways) of ICC A117.1. In addition, doors and doorways serving toilet and bathing rooms that are required to comply with Appendix P shall also comply with Section P102.3.

### Exceptions:

- 1. Maneuvering clearance at doors.** Where pull side, latch approach maneuvering clearance is required within the dwelling or sleeping unit for a door without a closer as per Figure 404.2.3.2(f) of ICC A117.1, the minimum maneuvering clearance perpendicular to the doorway shall be permitted to be reduced to 42 inches (1067 mm).
- 2. Door hardware.** Door hardware on doors within the dwelling or sleeping unit, except on entrance doors, shall not be required to comply with Section 404.2.6 (Door Hardware) of ICC A117.1 provided such hardware is readily replaceable without the removal or replacement of the door.
- 3. Future reversibility for bedroom doors.** Bedroom doors and frames shall be permitted to be provided with mortised hinge and latch blanks to permit future reversal of the door on the same frame using common hand tools and without further alterations to the door and frame, provided such future swing of the door will not obstruct the maneuvering clearances required at the door or doorway.
- 4. Storage facility doors.** Door maneuvering clearances are not required for doors that are accessed

from the interior of a closet within a dwelling unit or sleeping unit.

- 5. Supplemental toilet and bathing rooms.** Where one Type A toilet and bathing room is provided in a Type B+NYC unit in accordance with the exception in Section 1107.2.2, the doors and doorways to all other toilet and bathing rooms in that dwelling unit or sleeping unit shall not be required to comply with maneuvering clearances, but shall comply with Section 1004.5.2 (User Passage Doorways) of ICC A117.1 and shall provide clear opening width of 32 inches (813 mm) minimum.

### 1107.2.2 Type B+NYC unit toilet and bathing rooms.†

Where toilet and bathing rooms are provided in the Type B+NYC dwelling unit or sleeping unit, all such toilet and bathing rooms shall comply with Appendix P.

#### Exception for Type A toilet and bathing room:

- Where at least one toilet and bathing room in the Type B+NYC dwelling unit or sleeping unit is constructed in accordance with the Type A toilet and bathing facilities requirements of Section 1003.11 (Toilet and Bathing Facilities), including Section 1003.3.2 (Turning Space), of ICC A117.1 and is in compliance with the following:
  - †At least one lavatory, one water closet and either a bathtub or shower within such toilet or bathing facility shall comply with Section 1003.11 of ICC A117.1. Such toilet and bathing fixtures shall be in a single toilet or bathing area, such that travel between fixtures does not require travel beyond the area in which the fixtures of such toilet or bathing room are located.
  - †Toilet paper dispensers within such rooms shall comply with Section 604.7 (Dispensers) of ICC A117.1.
  - †Medicine cabinets, if provided, must include a storage shelf no higher than 44 inches (1118 mm) above the floor.
- Where at least one toilet and bathing room complying with Sections 1003.11 and 1002.3.2 of ICC A117.1 is provided within the Type B+NYC dwelling unit or sleeping unit in accordance with Item 1 of this exception, other toilet and bathing rooms in the same unit shall be required to comply only with Sections 1004.3 (Accessible route), 1004.4 (Walking Surfaces), 1004.5.2 (User Passage Doorways), 1004.9 (Operable Parts) and 1004.11.1 (Grab Bar and Shower Seat Reinforcement) of ICC A117.1. Doors and doorways to such toilet and bathing rooms shall be subject to Section 1107.2.1, Exception 5.

### 1107.2.3 Type B+NYC unit kitchen and kitchenette.

Where kitchens and kitchenettes are provided in the Type B+NYC dwelling unit or sleeping unit, the primary



kitchen or kitchenette shall be constructed in accordance with the kitchen requirements of Section 1003.12 (Kitchen) of ICC A117.1 and Sections 1107.2.3.1 through 1107.2.3.5 of this code. Secondary kitchens and kitchenettes within the same dwelling unit or sleeping unit shall be required to comply only with Section 1004.12 (Kitchens) of ICC A117.1.

**1107.2.3.1 Kitchen counters.** A kitchen counter that is required to comply with Section 1003.12.3.2 or 1003.12.4.2 (Height) of ICC A117.1 shall be permitted to be adjustable or designed to be replaceable as a unit at variable heights between 29 inches and 36 inches (737 mm and 914 mm), measured from the floor to the top of the work surface. The owner shall adjust or replace such countertop at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.

**1107.2.3.2 Appliances in kitchen and kitchenette.** Appliances shall comply with Section 1003.12.5 (Appliances) of ICC A117.1.

**Exception:** Where appliances' controls are not in compliance with Section 309.3 (Height) of ICC A117.1, the owner shall replace such appliances with appliances in conformance with Section 309.3 of ICC A117.1 at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense. However, the owner shall not be responsible to provide a particular model or type of appliances provided such appliances and controls comply with Sections 309.3 and 1003.12.5 of ICC A117.1.

**1107.2.3.3 Refrigerator/freezers.** Combination refrigerators and freezers shall comply with Section 1003.12.5.6 (Refrigerator/Freezer) of ICC A117.1. In addition, where less than 100 percent of storage volume of the freezer is located within 54 inches (1372 mm) maximum above the floor, such freezer shall be a self-defrosting type.

**Exception:** Where refrigerators and freezers are not in compliance with this section, the owner shall replace such appliances with complying appliances at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense. However, the owner shall not be responsible to provide a particular model or type of appliances provided such appliances comply with this section.

**1107.2.3.4 Cooktops and ovens.** Cooktops and ovens shall comply with Sections 1003.12.5.4 and 1003.12.5.5 of ICC A117.1, respectively. However, oven controls shall not be required to be located on either side of the oven door, provided such controls comply with Section 1003.12.5.5.4 of ICC A117.1.

Where double ovens are provided, at least one oven interior and its controls shall comply with Section 309.3 (Height) of ICC A117.1.

**1107.2.3.5 Kitchen and kitchenette storage.** Kitchen storage, kitchen cabinets, drawers, and shelf storage areas, within kitchen and kitchenettes that are required to comply with Section 1003.12 of ICC A117.1 pursuant to Section 1107.2.3, except overhead cabinets, shall comply with Section 905 (Storage Facilities) of ICC A117.1. In addition, at least one storage shelf or cabinet, mounted above work counters at 48 inches (1219 mm) maximum above the floor, shall be provided.

**Exception:** Where the storage shelf or cabinet is not provided in accordance with this section, the owner shall install such storage shelf or cabinet in compliance with this section at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.

**1107.2.4 Type B+NYC unit operable windows.** All operable windows required to provide natural ventilation and/or an emergency escape and rescue opening in rooms or spaces in the Type B+NYC dwelling unit or sleeping unit shall comply with Section 1003.13 (Windows) of ICC A117.1.

**Exceptions:**

1. Where windows that are required to provide natural ventilation are not in compliance with reach ranges specified in Section 309.3 (Height) for operable parts as required by Section 1003.13.1 of ICC A117.1, the operable parts of such windows shall be designed to be operable by the use of adaptive devices. The owner shall provide such adaptive devices at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.
2. Compliance with Section 1107.2.4 is not required in kitchenettes less than 80 square feet (7.4 m<sup>2</sup>) in area and equipped with an accessible mechanical means of ventilation complying with the *New York City Mechanical Code*, and in bathrooms equipped with an accessible mechanical means of ventilation complying with the *New York City Mechanical Code*.

**1107.2.5 Type B+NYC multistory units.** Multistory Type B+NYC dwelling units or sleeping units shall comply with the following:

1. One of the stories with an accessible entrance shall be designated as the primary entry story to the unit;
2. All rooms, spaces and doors on the primary entry story shall comply with Section 1107.2; and
3. Rooms, spaces or doors located on other than the primary entry story, and interior routes thereto,

need not comply with Section 1107.2 where the primary entry story contains equivalent functional facilities. Functional facilities shall include cooking facilities, bathing facilities, laundry equipment, sleeping areas, living areas, dining areas, and outdoor areas such as balconies or terraces.

**Exception:** Functional facilities in compliance with Section 1107.2 need not be located on the primary entry story, but may be located on any story within the dwelling unit or sleeping unit, provided that all rooms, spaces and doors located on such story containing such functional facilities comply with Section 1107.2. Notwithstanding the above, at least one toilet room complying with Section 1107.2.2 shall be provided on the primary entry story. In addition, one of the following conditions shall be met:

1. An accessible external elevator is provided to connect all such stories of the multistory dwelling unit or sleeping unit; or
2. A stairway complying with Section 504 (Stairways) of ICC A117.1 with a minimum clear width of 36 inches (914 mm) is provided within the multistory dwelling unit or sleeping unit to connect all such stories of the unit; or
3. An accessible route complying with Section 402 (accessible routes) of ICC A117.1 is provided within the dwelling unit or sleeping unit to connect all such stories of the unit.

#### 1107.2.6 Type B+NYC unit raised or sunken floor area.

Where a raised or sunken floor area in a portion of a living, dining, or sleeping room within a Type B+NYC dwelling unit or sleeping unit that is permitted by Section 1004.3 (Accessible route, Exception 1 and 2) of ICC A117.1 is provided, steps complying with Section 504 (Stairways) of ICC A117.1 with a minimum clear width of 36 inches (914 mm) shall connect such portion of raised or sunken floor area to an accessible route. In addition, a minimum area of 80 square feet (7.4 m<sup>2</sup>), and 8 feet (2438 mm) in one dimension, of each of such living, dining, or sleeping room shall be connected by an accessible route that is in compliance with Section 1004.3.2 (Components) of ICC A117.1.

**1107.2.7 Type B+NYC unit storage facilities.** Where storage facilities are provided within the Type B+NYC dwelling unit or sleeping unit, they shall comply with Section 905 (Storage Facilities) of ICC A117.1.

#### Exceptions:

1. A turning space shall not be required in storage facilities.
2. Where accessible storage elements are not in compliance with Section 905.3 of ICC A117.1, the owner shall relocate such elements to be in compliance with the section at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.

**1107.2.8 Type B+NYC unit laundry equipment.** Where washing machines or clothes dryers are provided within the Type B+NYC dwelling unit or sleeping unit, such equipment shall comply with Section 611 (Washing Machines and Clothes Dryers) of ICC A117.1 and shall be front loading. Laundry equipment in accessible common-use areas as required in Section 1107.3 shall comply with Section E105.2.

**Exception:** At the option of the owner, laundry equipment conforming to this section within the dwelling unit or sleeping unit may be provided at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense. However, the owner shall not be responsible to provide a particular model or type of equipment provided such equipment complies with this section.

**1107.3 Accessible spaces.** Rooms and spaces available to the general public or available for common use by residents of Accessible units, Type B+NYC units, or Type B units shall be accessible. Accessible spaces shall include, but not be limited to, spaces for residents' use, such as laundry rooms, refuse disposal and storage locations, mailbox areas, recreational facilities, assembly and tenants' meeting rooms, storage rooms, parking areas, toilet and bathing rooms, kitchen, living and dining areas, any exterior spaces, including patios, terraces and balconies, management offices, and stores.

**Exception:** In Group I-2 facilities, doors to sleeping units shall be exempted from the requirements for maneuvering clearance at the room side provided the door is a minimum of 44 inches (1118 mm) in width.

**1107.3.1 Mailboxes.** Except as otherwise provided by rules of the department for the purposes of complying with rules and regulations established by the United States Postal Service and/or the United States Department of Housing and Urban Development, where mailboxes are provided for each dwelling unit or sleeping unit in an interior location, 100 percent of such mailboxes shall comply with ICC A117.1, and the operable parts of such mailboxes shall be no higher than 48 inches (1219 mm) above the finished floor.

**1107.4 Accessible route.** At least one accessible route shall connect accessible building or facility entrances with the required accessible entrance(s) of each Accessible unit, Type B+NYC unit, and Type B unit within the building or facility and with those exterior and interior spaces and facilities that serve the units.

**Exception:** Exterior spaces, including but not limited to roof terraces, exterior decks, patios or balconies that are part of Type B+NYC units or Type B units, that are not for public use or common use, that have impervious surfaces, and that are not more than 4 inches (102 mm) below the finished floor level of the adjacent interior space of the unit. Such roof terraces, decks, patios or balconies shall be designed so that accessibility can be readily provided, without modifications to the guard rail heights and structural supports, by the installation of a

NYC noncombustible ramp in compliance with Section 405  
 NYC (Ramps) of ICC A117.1, or a noncombustible level plat-  
 NYC form, with removable panel for access to floor drainage,  
 NYC that is permeable to weather and in compliance with Sec-  
 NYC tion 302 (Floor Surfaces) and Section 303 (Changes in  
 NYC Level) of ICC A117.1.

NYC **1107.5 Group I.** Accessible units shall be provided in Group  
 I occupancies in accordance with Sections 1107.5.1 through  
 1107.5.5.‡

NYC **1107.5.1 Group I-1 Accessible‡ units.** In Group I-1  
 NYC occupancies, at least ten percent, but not less than one, of  
 NYC the dwelling units and sleeping units shall be Accessible  
 NYC units. The remainder shall be Type B+NYC units with all  
 NYC grab bars installed where grab bar reinforcements are  
 NYC required.

#### Exceptions:

1. In Group I-1 occupancies classified as “convalescent facilities,” one hundred percent of the dwelling units or sleeping units shall be Accessible units.
2. In Group I-1 occupancies where the governmental agency that licenses, funds or approves such facilities documents that such facilities are not targeted for people with conditions that affect mobility, at least five percent, but not less than one, of the dwelling units and sleeping units shall be Accessible units, and the remainder shall be Type B+NYC units. Conditions that affect mobility include conditions requiring the use or assistance of a brace, cane, crutch, prosthetic device, wheelchair, or powered mobility aid; arthritic, neurological, or orthopedic conditions that severely limit one’s ability to walk; respiratory diseases and other conditions which may require the use of portable oxygen; and cardiac conditions that impose significant functional limitations.

NYC **1107.5.2 Group I-2 Nursing homes Accessible units.** In  
 NYC nursing homes of Group I-2 occupancies 100 percent of  
 NYC the dwelling units and sleeping units shall be Accessible  
 NYC units.

NYC **1107.5.3 Group I-2 Hospitals.** In general purpose hospi-  
 NYC tals, psychiatric facilities, detoxification facilities and res-  
 NYC idential care/assisted living facilities of Group I-2  
 NYC occupancies‡ 100 percent of the dwelling units and sleep-  
 NYC ing units shall be Accessible units.

NYC **1107.5.4 Group I-2 Rehabilitation facilities.** In hospitals  
 NYC and rehabilitation facilities of Group I-2 occupancies  
 NYC which specialize in treating conditions that affect mobil-  
 NYC ity, or units within either which specialize in treating con-  
 NYC ditions that affect mobility, 100 percent of the dwelling  
 NYC units and sleeping units shall be Accessible units.

NYC **1107.5.4.1 Enriched assisted living residences**  
 NYC **(EALR‡) and special needs assisted living resi-**

NYC **dences (SNALR‡).** In enriched assisted living resi-  
 NYC dences (EALR‡) and special needs assisted living  
 NYC residences (SNALR‡) licensed by the New York State  
 NYC Department of Health, at least ten percent, but not less  
 NYC than one, of the dwelling units and sleeping units shall  
 NYC be Accessible units. The remainder shall be Type  
 NYC B+NYC units with all grab bars installed where grab  
 NYC bar reinforcements are required.

**1107.5.5 Group I-3.** Accessible units shall be provided in  
 Group I-3 occupancies in accordance with Sections  
 1107.5.5.1 through 1107.5.5.3.

**1107.5.5.1 Group I-3 sleeping units.** In Group I-3  
 occupancies, at least two percent, but not less than one,  
 of the dwelling units and sleeping units shall be Acces-  
 sible units.

**1107.5.5.2 Special holding cells and special housing  
 cells or rooms.** In addition to the Accessible units  
 required by Section 1107.5.5.1, where special holding  
 cells or special housing cells or rooms are provided, at  
 least one serving each purpose shall be an Accessible  
 unit. Cells or rooms subject to this requirement  
 include, but are not limited to, those used for purposes  
 of orientation, protective custody, administrative or  
 disciplinary detention or segregation, detoxification  
 and medical isolation.

**Exception:** Cells or rooms specially designed with-  
 out protrusions and that are used solely for purposes  
 of suicide prevention shall not be required to  
 include grab bars.

**1107.5.5.3 Medical care facilities.** In addition to any  
 medical isolation cells required by Section 1107.5.5.2  
 to be Accessible units,‡ 100 percent of the patient  
 sleeping units or cells in medical facilities of Group‡ I-  
 3 occupancies shall be Accessible units.‡

**1107.6 Group R.** Accessible units, Type B+NYC units and  
 Type B units shall be provided in Group R occupancies in  
 accordance with Sections 1107.6.1 through 1107.6.3.

**1107.6.1 Group R-1.** Accessible units, Type B+NYC  
 units, and Type B units shall be provided in Group R-1  
 occupancies in accordance with Sections 1107.6.1.1  
 through 1107.6.1.3.

**Exception:** Boarding houses, dormitories, fraternity  
 houses and sorority houses in Group R-1 occupancies  
 shall comply with Section 1107.6.1.4.

**1107.6.1.1 Accessible units.** In Group R-1 occupa-  
 cies, Accessible dwelling units and sleeping units shall  
 be provided in accordance with Table 1107.6.1.1. All  
 dwelling units and sleeping units in Group R-1 occu-  
 pancies on a site shall be considered to determine the  
 total number of Accessible units. Accessible units shall  
 be dispersed among the various classes of units. Roll-  
 in showers provided in Accessible units shall include a  
 permanently mounted folding shower seat.



†TABLE 1107.6.1.1  
ACCESSIBLE DWELLING AND SLEEPING UNITS

TOTAL NUMBER OF UNITS PROVIDED	MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITHOUT ROLL-IN SHOWERS	MINIMUM REQUIRED NUMBER OF ACCESSIBLE UNITS WITH ROLL-IN SHOWERS	TOTAL NUMBER OF REQUIRED ACCESSIBLE UNITS
1 to 25	1	0	1
26 to 50	2	0	2
51 to 75	3	1	4
76 to 100	4	1	5
101 to 150	5	2	7
151 to 200	6	2	8
201 to 300	7	3	10
301 to 400	8	4	12
401 to 500	9	4	13
501 to 1,000	2% of total	1% of total	3% of total
Over 1,000	20, plus 1 for each 100, or fraction thereof, over 1,000	10 plus 1 for each 100, or fraction thereof, over 1,000	30 plus 2 for each 100, or fraction thereof, over 1,000

**1107.6.1.2 Type B+NYC units.** In structures with four or more dwelling units or sleeping units intended to be occupied as a residence, every dwelling unit and sleeping unit intended to be occupied as a residence not required to be an Accessible unit shall be a Type B+NYC unit unless the number of Type B+NYC units is permitted to be reduced in accordance with Section 1107.7.4. Where no Type B+NYC units are required per Section 1107.7.4, all units not required to be Accessible units shall be Type B units.

**Exception:** The number of Type B units is permitted to be reduced in accordance with Section 1107.7.

**1107.6.1.3 Doors and doorways.** In all units, including those not required to be Accessible units, Type B+NYC units, or Type B units, entrances,‡ doors, and doorways providing user passage into and within units shall comply with Section 404.2.2 (Clear Width) of ICC A117.1.

**1107.6.1.4 Boarding houses, dormitories, fraternity houses and sorority houses in Group R-1.** Accessible units and Type B+NYC units shall be provided in boarding houses, dormitories, fraternity houses and sorority houses in Group R-1 occupancies in accordance with Sections 1107.6.1.4.1 and 1107.6.1.4.2.

**1107.6.1.4.1 Accessible units.** Accessible dwelling units and sleeping units shall be provided in accordance with Table 1107.6.1.1.

**1107.6.1.4.2 Type B+NYC units.** Every dwelling unit and every sleeping unit not required to be an Accessible unit shall be a Type B+NYC unit unless the number of Type B+NYC units is permitted to be reduced in accordance with Section 1107.7.4. Where no Type B+NYC units are required in accordance with Section 1107.7.4, all units shall be Type B units.

**Exception:** The number of Type B units is permitted to be reduced in accordance with Section 1107.7.

**1107.6.2 Group R-2.** Type B+NYC units and Type B units shall be provided in occupancies in Group R-2 in accordance with Section 1107.6.2.1.

**1107.6.2.1 Type B and Type B+NYC units.** Every dwelling unit and sleeping unit shall be a Type B+NYC unit unless the number of Type B+NYC units is permitted to be reduced in accordance with Section 1107.7.4. Where no Type B+NYC units are required in accordance with Section 1107.7.4, all units intended to be occupied as a residence shall be Type B units.

**Exception:** The number of Type B units is permitted to be reduced in accordance with Section 1107.7.

**1107.6.3 Group R-3.** In Group R-3 occupancies where there are four or more dwelling units or sleeping units intended to be occupied as a residence in a single structure, every dwelling unit and sleeping unit intended to be occupied as a residence shall be a Type B unit.

**Exception:** The number of Type B units is permitted to be reduced in accordance with Section 1107.7.

**1107.7 General exceptions for Type B units.** Where specifically permitted by Section 1107.6, the required number of Type B units is permitted to be reduced in accordance with Sections 1107.7.1 through 1107.7.3.

**1107.7.1 Structures without elevator service where Type B units are required.** Where no elevator service is provided in a structure or required by other sections of this code,‡ only the dwelling units and sleeping units that are located on stories indicated in Sections 1107.7.1.1 and 1107.7.1.2 are required to be Type B units.

**1107.7.1.1 One story with Type B units required.** At least one story containing dwelling units or sleeping units intended to be occupied as a residence shall be provided with an accessible entrance and accessible route from the exterior of the structure and all units intended to be occupied as a residence on that story shall be Type B units.



If other stories containing dwelling units or sleeping units intended to be occupied as a residence are served by a building entrance that is in proximity to arrival points as indicated in Items 1 and 2, such building entrance shall be accessible and all dwelling units and sleeping units intended to be occupied as a residence served by that entrance on that story shall be Type B units.

1. Where the slopes of the undisturbed site measured between the planned entrance and all vehicular or pedestrian arrival points within 50 feet (15 240 mm) of the planned entrance are 10 percent or less, and
2. Where the slopes of the planned finished grade measured between the entrance and all vehicular or pedestrian arrival points within 50 feet (15 240 mm) of the planned entrance are 10 percent or less.

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less of intent to occupy as a residence, shall be provided with an accessible entrance and accessible route from the exterior of the building or structure and all units on that story, regardless of intent to occupy as a residence, shall be Type B+NYC units. Where no dwelling units or sleeping units are located in the cellar, basement, or first floor, Type B units shall be provided where required by Section 1107.7.1 through 1107.7.3.

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CAPACITY OF SEATING IN ASSEMBLY AREAS	MINIMUM REQUIRED NUMBER OF WHEELCHAIR SPACES
4 to 25	1
26 to 50	2
51 to 100	4
101 to 300	5
301 to 500	6
501 to 5,000	6, plus 1 for each 150, or fraction thereof, between 501 through 5,000
5,001 and over	36 plus 1 for each 200, or fraction thereof, over 5,000

**1108.2.2.2 Luxury boxes, club boxes and suites.** In each luxury box, club box, and suite within arenas, stadiums and grandstands, wheelchair spaces shall be provided in accordance with Table 1108.2.2.1.

**1108.2.2.3 Other boxes.** In boxes other than those required to comply with Section 1108.2.2.2, the total number of wheelchair spaces provided shall be determined in accordance with Table 1108.2.2.1. Wheelchair spaces shall be located in not less than 20 percent of all boxes provided.

**1108.2.2.4 Team or player seating.** At least one wheelchair space shall be provided in team or player seating areas serving areas of sport activity.

**Exception:** Wheelchair spaces shall not be required in team or player seating areas serving bowling lanes that are not required to be located on an accessible route in accordance with Section 1109.14.4.1.

**1108.2.3 Companion seats.** At least one companion seat complying with ICC A117.1 shall be provided for each wheelchair space required by Sections 1108.2.2.1 through 1108.2.2.3.

**1108.2.4 Dispersion of wheelchair spaces in multilevel assembly seating areas.** In multilevel assembly seating areas, wheelchair spaces shall be provided on the main floor level and on one of each two additional floor or mezzanine levels. Wheelchair spaces shall be provided in each luxury box, club box and suite within assembly facilities.

**Exceptions:**

1. In multilevel assembly spaces utilized as place of religious worship where the second floor or mezzanine level contains 25 percent or less of the total seating capacity, wheelchair spaces shall be permitted to all be located on the main level.
2. In multilevel assembly seating where the second floor or mezzanine level provides 25 percent or less of the total seating capacity and 300 or fewer seats, all wheelchair spaces shall be permitted to be located on the main level.

3. Wheelchair spaces in team or player seating serving areas of sport activity are not required to be dispersed.

**1108.2.5 Designated aisle seats.** At least five percent, but not less than one, of the total number of aisle seats provided shall be designated aisle seats, shall be the aisle seats located closest to accessible routes, and shall comply with ICC A117.1, including Section 802.8 (Designated Aisle Seats).

**Exception:** Designated aisle seats are not required in team or player seating serving areas of sport activity.

**1108.2.6 Lawn seating.** Lawn seating areas and exterior overflow seating areas, where fixed seats are not provided, shall connect to an accessible route.‡

**1108.2.7 Assistive listening systems.** Each assembly area where audible communications are integral to the use of the space shall have an assistive listening system in compliance with ICC A117.1, including Section 706 (Assistive Listening Systems) and Appendix N of this code.

**Exception:** Other than in courtrooms, an assistive listening system is not required where there is no audio amplification system.

**1108.2.7.1 Receivers.** Receivers shall be provided for assistive listening system in accordance with Table 1108.2.7.1. All receivers shall be hearing-aid compatible.

**Exceptions:**

1. Where a building contains more than one assembly area, the total number of required receivers shall be permitted to be calculated according to the total number of seats in the assembly areas in the building, provided that all receivers are usable with all systems, and if assembly areas required to provide assistive listening are under one management.
2. Where all seats in an assembly area are served by an induction loop assistive listening system, the minimum number of receivers required by Table 1108.2.7.1 to be hearing-aid compatible shall not be required.

**TABLE 1108.2.7.1  
RECEIVERS FOR ASSISTIVE LISTENING SYSTEMS**

CAPACITY OF SEATING IN ASSEMBLY AREAS	MINIMUM REQUIRED NUMBER OF RECEIVERS	MINIMUM NUMBER OF RECEIVERS TO BE HEARING-AID COMPATIBLE
50 or less	2	2
51 to 200	2, plus 1 per 25 seats over 50 seats*	2
201 to 500	2, plus 1 per 25 seats over 50 seats.*	1 per 4 receivers*
501 to 1,000	20, plus 1 per 33 seats over 500 seats*	1 per 4 receivers*
1,001 to 2,000	35, plus 1 per 50 seats over 1,000 seats*	1 per 4 receivers*
Over 2,000	55, plus 1 per 100 seats over 2,000 seats*	1 per 4 receivers*

NOTE: \* = or fraction thereof.

**1108.2.7.2 Public address systems.** Where stadiums, arenas and grandstands provide audible public announcements, they shall also provide equivalent text information regarding events and facilities in compliance with Sections 1108.2.7.2.1 and 1108.2.7.2.2

**1108.2.7.2.1 Prerecorded text messages.** Where electronic signs are provided and have the capability to display prerecorded text messages containing information that is the same, or substantially equivalent, to information that is provided audibly, signs shall display text that is equivalent to audible announcements.

**Exception:** Announcements that cannot be prerecorded in advance of the event shall not be required to be displayed.

**1108.2.7.2.2 Real-time messages.** Where electronic signs are provided and have the capability to display real-time messages containing information that is the same, or substantially equivalent, to information that is provided audibly, signs shall display text that is equivalent to audible announcements.

**1108.2.8 Performance areas.** An accessible route shall directly connect the performance area to the assembly seating area where a circulation path directly connects a performance area to an assembly seating area. An accessible route shall be provided from performance areas to ancillary areas or facilities used by performers.

**1108.2.9 Dining areas.** In dining areas, the total floor area allotted for seating and tables shall be accessible.

**Exceptions:**

1. In buildings or facilities not required to provide an accessible route between levels as described in Section 1104.4, Exception 1, an accessible route to a mezzanine seating area is not required, provided that the mezzanine contains less than 33 percent of the total seating area and the same services are provided in the accessible area.
2. In sports facilities, tiered dining areas providing seating required to be accessible shall be required to have accessible routes serving at least 25 percent of the dining area, provided that accessible routes serve accessible seating and where each tier is provided with the same services and similar view.

**1108.2.9.1 Dining surfaces.** Where dining surfaces for the consumption of food or drink are provided, at least 5 percent, but not less than one, of the dining surfaces for the seating and standing spaces shall be accessible and be distributed throughout the facility and located on a level connected by an accessible route.

**Exception:** Where food or drink is served at counters exceeding 34 inches (864 mm) in height, such dining surfaces shall not be required to comply with Section 1108.2.9.1 provided equivalent service is available at accessible tables or counters that are in compliance with Section 902 (Dining Surfaces and

Work Surfaces) of ICC A117.1 within the same dining area. NYC  
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**1108.3 Self-service storage facilities.** Self-service storage facilities shall provide accessible individual self-storage spaces in compliance with Section 1104 of this code and ICC A117.1, including Section 905 (Storage Facilities). The number of required self-storage spaces shall be in accordance with Table 1108.3. NYC  
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**TABLE 1108.3  
ACCESSIBLE SELF-SERVICE STORAGE FACILITIES**

TOTAL SPACES IN FACILITY	MINIMUM NUMBER OF REQUIRED ACCESSIBLE SPACES
1 to 200	5%, but not less than 1
Over 200	10, plus 2% of total number of units over 200

**1108.3.1 Dispersion.** Accessible individual self-service storage spaces shall be dispersed throughout the various classes of spaces provided. Where more classes of spaces are provided than the number of required accessible spaces, the number of accessible spaces shall not be required to exceed that required by Table 1108.3. Accessible spaces are permitted to be dispersed in a single building of a multibuilding facility.

**1108.4 Judicial facilities.** Judicial facilities shall comply with Sections 1108.4.1 through 1108.4.3.

**1108.4.1 Courtrooms.** Each courtroom shall be accessible and comply with ICC A117.1, including Section 807 (Courtrooms), and Sections 1108.4.1.1 through 1108.4.1.5. NYC  
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**1108.4.1.1 Jury box.** A wheelchair space complying with ICC A117.1 shall be provided within the jury box.

**Exception:** Adjacent companion seating is not required.

**1108.4.1.2 Gallery seating.** Wheelchair spaces complying with ICC A117.1 shall be provided in accordance with Table 1108.2.2.1. Designated aisle seats shall be provided in accordance with Section 1108.2.5.

**1108.4.1.3 Assistive listening systems.** An assistive listening system must be provided. Receivers shall be provided for the assistive listening system in accordance with Section 1108.2.7.1.

**1108.4.1.4 Employee work stations.** The judge's bench, clerk's station, bailiff's station, deputy clerk's station and court reporter's station shall be located on an accessible route. The vertical access to elevated employee work stations within a courtroom is not required at the time of initial construction, provided a ramp, lift or elevator complying with ICC A117.1 can be installed without requiring reconfiguration or extension of the courtroom or extension of the electrical system.

**1108.4.1.5 Other work stations.** The litigant's and counsel stations, including the lectern, shall be accessible in accordance with ICC A117.1.

**1108.4.2 Holding cells.** Central holding cells and court-floor holding cells shall comply with Sections 1108.4.2.1 and 1108.4.2.2.

**1108.4.2.1 Central holding cells.** Where separate central holding cells are provided for adult males, juvenile males, adult females or juvenile females, one of each type shall be accessible. Where central holding cells are provided and are not separated by age or sex, at least one accessible cell shall be provided.

**1108.4.2.2 Court-floor holding cells.** Where separate court-floor holding cells are provided for males, juvenile males, adult females or juvenile females, each courtroom shall be served by one accessible cell of each type. Where court-floor holding cells are provided and are not separated by age or sex, courtrooms shall be served by at least one accessible cell. Accessible cells shall be permitted to serve more than one courtroom.

**1108.4.3 Visiting areas.** Visiting areas shall comply with Sections 1108.4.3.1 and 1108.4.3.2.

**1108.4.3.1 Cubicles and counters.** At least 5 percent, but not fewer than one, of the cubicles shall be accessible on both the visitor and detainee sides. Where counters are provided, at least one shall be accessible on both the visitor and detainee sides.

**Exception:** This requirement shall not apply to the detainee side of cubicles or counters at noncontact visiting areas not serving accessible holding cells.

**1108.4.3.2 Partitions.** Where solid partitions or security glazing separate visitors from detainees, at least one of each type of cubicle or counter partition shall be accessible.

## SECTION BC 1109 OTHER FEATURES AND FACILITIES

**1109.1 General.** Accessible building features and facilities shall be provided in accordance with Sections 1109.2 through 1109.16.

**Exception:** Type B+NYC and Type B units shall comply with Section 1107 and ICC A117.1.

**1109.2 Toilet and bathing rooms.** Each toilet room and bathing room shall be accessible. Where a floor level is not required to be connected by an accessible route, the only toilet rooms or bathing rooms provided within the facility shall not be located on the inaccessible floor. At least one of each type of fixture, element, control or dispenser in each accessible toilet room and bathing rooms shall be accessible.

### Exceptions:

1. In nonresidential occupancies, for toilet rooms or bathing rooms accessed only through a private office, not for common or public use, and intended for use by a single occupant of such private office, any of the following alternatives are allowed:

1.1. Doors are permitted to swing into the clear floor space provided the door swing can be reversed

to meet the requirements in Section 603.2.2 (Door Swing) of ICC A117.1; and

1.2. The height requirements for the water closet in Section 604.4 (Height) of ICC A117.1 are not applicable; and

1.3. Grab bars are not required to be installed in a toilet room, provided that the reinforcement has been installed in the walls and located so as to permit the installation of such grab bars; and

1.4. The requirement for height, knee and toe clearance shall not apply to a lavatory.

2. This section is not applicable to dwelling units, sleeping units and patient toilet and bathing rooms that are not required to be accessible by Section 1107.

3. Where multiple single-user toilet rooms or bathing rooms are clustered to be within sight of, or adjacent to one another at a single location at least 50 percent, but not less than one room for each use at each cluster, shall be accessible.

4. Where no more than one urinal is provided in a toilet room or bathing room, the urinal is not required to be accessible.

5. Toilet rooms that are part of critical-care or intensive-care patient sleeping rooms are not required to be accessible.

6. Where multiple single user portable toilet or bathing units are clustered at a single location, not less than 5 percent of the toilet units and bathing units at each cluster shall be accessible. Accessible portable toilet units and bathing units shall be identified by the International Symbol of Accessibility complying with Section 1110.1.

**1109.2.1 Family or assisted-use toilet and bathing rooms.** In assembly and mercantile occupancies, an accessible family or assisted-use toilet room shall be provided where an aggregate of six or more male and female water closets is required. In buildings of mixed occupancy, only those water closets required for the assembly or mercantile occupancy shall be used to determine the family or assisted-use toilet room requirement. In recreational facilities where separate-sex bathing rooms are provided, an accessible family or assisted-use bathing room shall be provided. Fixtures located within family or assisted-use toilet and bathing rooms required by this section are permitted to be included in the number of fixtures required by the *New York City Plumbing Code* for either the male or female occupants.

**Exception:** Where each separate-sex bathing room has only one shower or bathtub fixture, a family or assisted-use bathing room is not required.

**1109.2.1.1 Standard.** Family or assisted-use toilet and bathing rooms shall comply with Sections 1109.2.1.2 through 1109.2.1.7 and ICC A117.1.

**1109.2.1.2 Family or assisted-use toilet rooms.** Family or assisted-use toilet rooms shall include only one



water closet and only one lavatory. A family or assisted-use bathing room in accordance with Section 1109.2.1.3 shall be considered a family or assisted-use toilet room.

**Exception:** A urinal is permitted to be provided in addition to the water closet in a family or assisted-use toilet room.

**1109.2.1.3 Family or assisted-use bathing rooms.** Family or assisted-use bathing rooms shall include only one shower or bathtub fixture. Family or assisted-use bathing rooms shall also include one water closet and one lavatory. Where storage facilities are provided for separate-sex bathing rooms, accessible storage facilities complying with Section 1109.8 shall be provided for family or assisted-use bathing rooms.

**1109.2.1.4 Location.** Family or assisted-use toilet and bathing rooms shall be located on an accessible route. Family or assisted-use toilet rooms shall be located not more than one story above or below separate-sex toilet rooms. The accessible route from any separate-sex toilet room to a family or assisted-use toilet room shall not exceed 500 feet (152 m).

**1109.2.1.5 Prohibited location.** In passenger transportation facilities and airports, the accessible route from separate-sex toilet rooms to a family or assisted-use toilet room shall not pass through security checkpoints.

**1109.2.1.6 Clear floor space.** Where doors swing into a family or assisted-use toilet or bathing room, a clear floor space not less than 30 inches by 48 inches (762 mm by 1219 mm) shall be provided, within the room, beyond the area of the door swing.

**1109.2.1.7 Privacy.** Doors to family or assisted-use toilet and bathing rooms shall be securable from within the room.

**1109.2.2 Water closet compartment.** Where water closet compartments are provided in a toilet room or bathing room, at least one wheelchair-accessible compartment shall be provided. Where the combined total water closet compartments and urinals provided in a toilet room or bathing room is six or more, at least one ambulatory-accessible water closet compartment shall be provided in addition to the wheelchair-accessible compartment. Wheelchair-accessible and ambulatory-accessible compartments shall comply with ICC A117.1 including Section 604.9 (Wheelchair Accessible Compartments) and 604.10 (Ambulatory Accessible Compartments).

**1109.2.3 Lavatories.** Where lavatories are provided, at least 5 percent, but not less than one, shall be accessible. Where the total lavatories provided in a toilet room or bathing room is six or more, at least one lavatory with enhanced reach ranges in accordance with ICC A117.1, shall be provided.

**1109.3 Sinks.** Where sinks are provided, at least five percent, but not less than one, provided in accessible spaces

shall comply with ICC A117.1, including Section 606 (Lavatories and Sinks). NYC  
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**Exception:** Mop or service sinks are not required to be accessible.

**1109.4 Kitchens, kitchenettes and wet bars.** Where kitchen, kitchenettes and wet bars not located within dwelling or sleeping units, are provided in accessible spaces or rooms, they shall be accessible in accordance with ICC A117.1 including Section 804 (Kitchens and Kitchenettes). NYC  
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**1109.5 Drinking fountains.** Where drinking fountains are provided on an exterior site, on a floor or within a secured area, the drinking fountains shall be provided in accordance with Sections 1109.5.1 and 1109.5.2.† NYC

**1109.5.1 Minimum number.** No fewer than two drinking fountains shall be provided. One drinking fountain shall comply with the requirements for people who use a wheelchair and one drinking fountain shall comply with the requirements for standing persons.

**Exception:** A single drinking fountain that complies with the requirements for people who use a wheelchair and standing persons shall be permitted to be substituted for two separate drinking fountains.

**1109.5.2 More than the minimum number.** Where more than the minimum number of drinking fountains specified in Section 1109.5.1 are provided, 50 percent of the total number of drinking fountains provided shall comply with the requirements for persons who use a wheelchair and 50 percent of the total number of drinking fountains provided shall comply with the requirements for standing persons.

**Exception:** Where 50 percent of the drinking fountains yields a fraction, 50 percent shall be permitted to be rounded up or down, provided that the total number of drinking fountains complying with this section equals 100 percent of the drinking fountains.

**1109.5.3 Container faucets.** Where a separate faucet designed for filling a container is provided at the drinking fountain pursuant to Section 410.1 of the *New York City Plumbing Code*, such container faucet shall comply with Section 606.4 of ICC A117.1. NYC  
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**1109.6 Elevators.** All passenger elevators on an accessible route shall be accessible and comply with Section† 3001.3.

**1109.6.1 Limited-Use/Limited-Application (LULA) elevators.** LULA elevators shall comply with Section 408 (Limited-Use/Limited-Application Elevators) of ICC A117.1 and with Part XXV of ASME A17.1 and shall be limited to a maximum rise of not more than 25 feet (7620 mm)† and serving not more than three contiguous levels. In new construction, such LULA elevators shall be permitted: NYC  
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1. To be a part of the required accessible route where either a wheelchair lift complying with Section 1109.7 is permitted or a private residence elevator complying with Section 409 (Private Residence Elevators) of ICC A117.1 is permitted; NYC  
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2. To be part of the required accessible route in places of religious services; or
3. In multilevel buildings and facilities not required to have an accessible route pursuant to the exceptions in Section 1104.4.

**1109.6.1.1 Prior code buildings.** In prior code buildings, LULA elevators shall be permitted to be a part of the required accessible route where the total floor area of the entire building is less than 10,000 square feet (929 m<sup>2</sup>) provided such LULA elevator is limited to a maximum rise of not more than 25 feet, serves not more than three contiguous levels, and elevators are not otherwise required by Chapter 30.

**1109.7 Lifts.** Platform (wheelchair) lifts shall not be a part of a required accessible route in new construction except as indicated in Items 1 through 9. Platform (wheelchair) lifts shall be installed in accordance with Chapter 30 of this code, Section 410 (Platform Lifts) of ICC A117.1 and ASME A108.1. Platform (wheelchair) lifts are permitted to be part of a required accessible route in new construction as follows:

1. An accessible route to a performing area and speaker platforms in Group A occupancies.
2. An accessible route to wheelchair spaces required to comply with the wheelchair space dispersion requirements of Sections 1108.2.2 through 1108.2.6.
3. An accessible route to spaces that are not open to the general public with an occupant load of not more than five.
4. An accessible route as permitted in Section 1107.2.5 within a dwelling or sleeping unit.
5. An interior accessible route to jury boxes and witness stands; raised courtroom stations including judges' benches, clerks' stations, bailiffs' stations, deputy clerks' stations and court reporters' stations; and to depressed areas such as the well of the court.
6. An accessible route where existing exterior site constraints make use of a ramp or elevator infeasible as determined by the commissioner pursuant to the rules of the department.
7. An accessible route to load and unload areas serving amusement rides.
8. An accessible route to play components or soft contained play structures.
9. An accessible route to team or player seating areas serving areas of sport activity.

**1109.8 Storage.** Where fixed or built-in storage elements such as cabinets, shelves, medicine cabinets, closets, and drawers are provided in required accessible spaces, at least one of each type shall contain storage space complying with ICC A117.1.

**1109.8.1 Lockers.** Where lockers are provided in accessible spaces, at least five percent, but not less than one, of each type shall be accessible.

**1109.8.2 Shelving and display units.** Self-service shelves and display units shall be located on an accessible route.

Such shelving and display units shall not be required to comply with reach-range provisions.

**1109.8.3 Coat hooks and shelves.** Where coat hooks and shelves are provided in toilet rooms or toilet compartments, or in dressing, fitting or locker rooms, at least one of each type shall be provided in accessible toilet rooms without toilet compartments<sup>‡</sup>, accessible toilet compartments, and accessible dressing, fitting and locker rooms.

**1109.9 Detectable warnings.** Detectable warnings shall be provided where required in Sections 1109.9.1 through 1109.9.5.

**1109.9.1 Detectable warnings at passenger transit platforms.** Passenger transit platform edges bordering a drop-off and not protected by platform screens or guards shall have a detectable warning.

**Exception:** Detectable warnings are not required at bus stops.

**1109.9.2 Detectable warnings at hazardous vehicular areas.** If a walk crosses or adjoins a vehicular way, and the walking surfaces are not separated by curbs, railings, or other elements between the pedestrian areas and vehicular areas, the boundary between the areas shall be defined by a continuous detectable warning which is 36 inches (914 mm) wide.

**1109.9.3 Detectable warnings at pools.** The edges of pools shall be provided with detectable warnings.

**1109.9.4 Detectable warnings at curb ramps.** A curb ramp shall have a detectable warning. The detectable warning shall extend the full width and depth of the curb ramp.

**1109.9.5 Detectable warnings at other locations.** Detectable warnings shall be located at hazardous locations on floors, doors, and stairs. Doors that lead to areas that might prove hazardous to a person who is blind, including, but not limited to, doors to leading platforms, boiler rooms, and stages, shall be made identifiable to the touch by a textured surface on the door handle, knob, pull or other operating hardware. This textured surface may be made by knurling or roughening or by material applied to the contact surface. Such textured surfaces shall not be provided for emergency exit doors or any doors other than those to hazardous areas.

**1109.10 Seating at tables, counters and work surfaces.** Where seating at fixed or built-in tables, counters or work surfaces is provided in accessible spaces, at least 5 percent of the seating, but not less than one, shall be accessible. In Group I-3 occupancy visiting areas at least 5 percent, but not less than one, cubicle or counter shall be accessible on both the visitor and detainee sides.

#### Exceptions:

1. Check-writing surfaces at check-out aisles not required to comply with Section 1109.11.2 are not required to be accessible.
2. In Group I-3 occupancies, the counter or cubicle on the detainee side is not required to be accessible at

noncontact visiting areas or in areas not serving accessible holding cells or sleeping units.

**1109.10.1 Dispersion.** Accessible fixed or built-in seating at tables, counters or work surfaces shall be distributed throughout the space or facility containing such elements and located on a level accessed by an accessible route.

**NYC 1109.11 Service facilities.** Customer service facilities shall provide for accessible features in accordance with Sections 1109.11.1 through 1109.11.5.

**1109.11.1 Dressing, fitting and locker rooms.** Where dressing rooms, fitting rooms, or locker rooms are provided, at least five percent, but not less than one, of each type of use in each cluster provided shall be accessible.

**1109.11.2 Check-out aisles.** Where check-out aisles are provided, accessible check-out aisles shall be provided in accordance with Table 1109.11.2. Where check-out aisles serve different functions, at least one accessible check-out aisle shall be provided for each function. Where check-out aisles serve different functions, accessible check-out aisles shall be provided in accordance with Table 1109.11.2 for each function. Where check-out aisles are dispersed throughout the building or facility, accessible check-out aisles shall also be dispersed. Traffic control devices, security devices and turnstiles located in accessible check-out aisles or lanes shall be accessible.

**TABLE 1109.11.2  
ACCESSIBLE CHECK-OUT AISLES**

TOTAL CHECK-OUT AISLES OF EACH FUNCTION	MINIMUM NUMBER OF ACCESSIBLE CHECK-OUT AISLES OF EACH FUNCTION
1 to 4	1
5 to 8	2
9 to 15	3
Over 15	3, plus 20% of additional aisles

**NYC 1109.11.3 Point of sales and service counters.** Where counters are provided for sales or distribution of goods or services, at least one of each type provided shall be accessible. Where such counters are dispersed throughout the building or facility, the accessible counters shall also be dispersed.

**1109.11.4 Food service lines.** Food service lines shall be accessible. Where self-service shelves are provided, at least 50 percent, but not less than one, of each type provided shall be accessible.

**1109.11.5 Queue and waiting lines.** Queue and waiting lines servicing accessible counters or check-out aisles shall be accessible.

**1109.12 Controls, operating mechanisms and hardware.** Controls, operating mechanisms and hardware intended for operation by the occupant, including switches that control lighting and ventilation, and electrical convenience outlets,

in accessible spaces, along accessible routes or as parts of accessible elements shall be accessible.

**Exceptions:**

1. Operable parts that are intended for use only by use only by service or maintenance personnel shall not be required to be accessible. **NYC**
2. Electrical or communication receptacles serving a dedicated use shall not be required to be accessible.
3. Where two or more outlets are provided in a kitchen above a length of countertop that is uninterrupted by a sink or appliance, one outlet shall not be required to be accessible.
4. Floor electrical receptacles shall not be required to be accessible.
5. HVAC diffusers shall not be required to be accessible.
6. Except for light switches, where redundant controls are provided for a single element, one control in each space shall not be required to be accessible.
7. Access doors or gates in barrier walls and fences protecting pools, spas and hot tubs shall be permitted to have operable parts of the release of latch on self-latching devices at 54 inches (1370 mm) maximum and 48 inches (1219 mm) minimum above the finished floor or ground, provided the self-latching devices are not also self-locking devices, operated by means of a key, electronic opener, or integral combination lock.
8. Electrical panelboards in Type B+NYC units and Type B units. **NYC  
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**1109.12.1 Operable windows.** Where operable windows are provided in rooms or spaces that are required to be accessible in accordance with Sections 1107.5.1, 1107.5.2, 1107.5.3, 1107.5.4, 1107.6.1.1, and 1107.6.1.4.1, at least one window in each room shall be accessible and each required operable window shall be accessible. Where operable windows are provided in Type B+NYC units in accordance with Section 1107.6.2, such windows shall comply with Section 1107.2.4. **NYC  
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**Exception:** Accessible windows are not required in bathrooms or kitchens unless otherwise required in Section 1107.2.4. **NYC  
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**1109.13 Fuel-dispensing systems.** Fuel-dispensing systems shall comply with ICC A117.1.

**1109.14 Recreational and sports facilities.** Recreational and sports facilities shall be accessible. **NYC**

**1109.14.1 Recreational and sports facilities exceptions.** Recreational and sports facilities required to be accessible shall be exempt from this chapter to the extent specified in this section. **NYC  
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**1109.14.1.1 Bowling lanes.** An accessible route shall be provided to at least 5 percent, but no less than one, of each type of bowling lane.

**1109.14.1.2 Court sports.** In court sports, at least one accessible route shall directly connect both sides of the court.

**1109.14.1.3 Raised boxing or wrestling rings.** Raised boxing or wrestling rings are not required to be accessible.

**1109.14.1.4 Raised refereeing, judging and scoring areas.** Raised structures used solely for refereeing, judging or scoring a sport are not required to be accessible.

**1109.14.1.5 Raised diving boards and diving platforms.** Raised diving boards and diving platforms are not required to be accessible.

**1109.15 Stairways.** Stairways located alongside accessible routes connecting floor levels that are not connected by an elevator shall be designed and constructed to comply with ICC A117.1 and Chapter 10 of this code.

## SECTION BC 1110 SIGNAGE

**1110.1 Signs.** Required accessible elements shall be identified by the International Symbol of Accessibility at the following locations:

1. Accessible parking spaces required by Section 1106.1 except where the total number of parking spaces provided is no more than one.
2. Accessible passenger loading zones.
3. Accessible areas of rescue assistance required by Section 1007.6.
4. Exterior areas of assisted rescue required by Section 1007.6.
5. Accessible rooms where multiple single-user toilet or bathing rooms are clustered at a single location pursuant to Section 1109.2, Exception 3.
6. Accessible rooms where multiple single user portable toilet or bathing units are clustered at a single location pursuant to Section 1109.2, Exception 6.
7. Accessible entrances where not all entrances are accessible. The sign, where provided, shall include a contact telephone number or instructions to gain access if an otherwise accessible building entrance is locked at all times or locked when the building is otherwise open.
8. Accessible check-out aisles where not all aisles are accessible. The sign, where provided, shall be above the check-out aisle in the same location as the check-out aisle number or type of check-out identification.
9. Family or assisted-use toilet and bathing rooms.
10. Accessible dressing, fitting and locker rooms where not all such rooms are accessible.

11. Accessible seating.

12. Accessible portable toilets.

13. Public telephones.

**1110.2 Directional signage.** Directional signage indicating the route to the nearest like accessible element shall be provided at or in close proximity to the following locations, such that a person with disabilities will not be required to retrace the approach route from the inaccessible element. These directional signs shall include the International Symbol of Accessibility. Such signs shall comply with either Section 703.2 or Sections 703.3 and 703.4 of ICC A117.1:

1. Inaccessible building entrances.
2. Inaccessible public toilets and bathing facilities.
3. Elevators not serving an accessible route.
4. At each separate-sex toilet and bathing room indicating the location of the nearest accessible family or assisted-use toilet or bathing room where provided in accordance with Section 1109.2.1.
5. At exits and exit stairways serving an accessible space, but not providing an approved accessible means of egress, signage shall be provided in accordance with Section 1007.10.

**1110.3 Other signs.** Signage indicating special accessibility provisions shall be provided as follows:

1. Each assembly area required to comply with Section 1108.2.7 shall provide a sign notifying patrons of the availability of assistive listening systems.

**Exception:** Where ticket offices or windows are provided, signs are not required at each assembly area provided that signs are displayed at each ticket office or window informing patrons of the availability of assistive listening systems.

2. At each door to an area of rescue assistance, an exterior area for assisted rescue, an egress stairway, exit passageway and exit discharge, signage shall be provided in accordance with Section 1011.3.
3. At areas of rescue assistance, signage shall be provided in accordance with Section 1007.11.
4. At exterior areas for assisted rescue, signage shall be provided in accordance with Section 1007.11.
5. At two-way communication systems, signage shall be provided in accordance with Section 1007.8.2.
6. Within exit enclosures, signage shall be provided in accordance with Section 1022.8.

**1110.4 Variable message signs.** Where provided in the locations in Sections 1110.4.1 and 1110.4.2, variable message signs (VMS) shall comply with the VMS requirements of ICC A117.1.

**1110.4.1 Transportation facilities.** Where provided in transportation facilities, variable message signs conveying transportation-related information shall comply with Section 1110.4.

**1110.4.2 Emergency shelters.** Where provided in buildings that are designated as emergency shelters, variable



## ACCESSIBILITY

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message signs conveying emergency-related information shall comply with Section 1110.4.

**Exception:** Where equivalent information is provided in an audible manner, VMS signs are not required to comply with ICC A117.1.

## CHAPTER 12

# INTERIOR ENVIRONMENT

### SECTION BC 1201 GENERAL

**1201.1 Scope.** The provisions of this chapter shall govern ventilation, temperature control, lighting, yards and courts, sound transmission, room dimensions, surrounding materials and rodent proofing associated with the interior spaces of buildings.

### SECTION BC 1202 DEFINITIONS

**1202.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**HABITABLE SPACE.** All rooms and spaces within a dwelling unit in Group R or I-1, including bedrooms, living rooms, studies, recreation rooms, kitchens, dining rooms and other similar spaces.

**Exception:** The following spaces within a dwelling unit shall not be considered habitable spaces:

1. A dining space 55 square feet (5.1 m<sup>2</sup>) or less located off a living room, foyer or kitchen;
2. A kitchenette;
3. A bathroom or toilet room;
4. A laundry room; and
5. A corridor, passageway, or private hall; and a foyer used as an entrance hall in a dwelling unit: not exceeding 10 percent of the total floor area of the dwelling unit; or not exceeding 20 percent of the floor area of the dwelling unit where every habitable room is at least 20 percent larger than the required minimum room sizes established by the *New York City Housing Maintenance Code*.

**KITCHEN.** A room with 80 square feet (7.4 m<sup>2</sup>) or more of floor area which is intended, arranged, designed or used for cooking or warming of food.

**KITCHENETTE.** A space with less than 80 square feet (7.4 m<sup>2</sup>) of floor area which is intended, arranged, designed or used for cooking or warming of food.

**OCCUPIABLE SPACE.** A room or enclosed space, other than a habitable space, designed for human occupancy or use in which individuals may remain for a period of time for rest, amusement, treatment, education, dining, shopping, employment, labor or other similar purposes.

**SUNROOM.** A one-story structure attached to a building with a glazing area in excess of 40 percent of the gross area of the structure's exterior walls and roof.

**THERMAL ISOLATION.** Physical and space conditioning separation from conditioned space(s). The conditioned

space(s) shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

### SECTION BC 1203 VENTILATION

**1203.1 General.** Buildings shall be provided with natural ventilation in accordance with Section 1203.4, and/or mechanical ventilation in accordance with the *New York City Mechanical Code*. All habitable spaces shall be provided with natural ventilation in accordance with Section 1203.4.

**1203.2 Attic spaces.** Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof framing members shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain and snow. Blocking and bridging shall be arranged so as not to interfere with the movement of air. A minimum of 1 inch (25 mm) of airspace shall be provided between the insulation and the roof sheathing. The net free ventilating area shall not be less than 1/150 of the area of the space ventilated, with 50 percent of the required ventilating area provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet (914 mm) above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

**1203.2.1 Openings into attic.** Exterior openings into the attic space of any building intended for human occupancy shall be protected to prevent the entry of birds, squirrels, rodents, snakes and other similar creatures. Openings for ventilation having at least a dimension of 1/16 inch (1.6 mm) minimum and 1/4 inch (6.4 mm) maximum shall be permitted. Openings for ventilation having a least dimension larger than 1/4 inch (6.4 mm) shall be provided with corrosion-resistant wire cloth screening, hardware cloth, perforated vinyl or similar material with openings having a least dimension of 1/16 inch (1.6 mm) minimum and 1/4 inch (6.4 mm) maximum. Where combustion air is obtained from an attic area, it shall be in accordance with Chapter 7 of the *New York City Mechanical Code*.

**1203.3 Under-floor ventilation.** The space between the bottom of the floor joists and the surface under any building except spaces occupied by basements or cellars shall be provided with ventilation openings through foundation walls or exterior walls. Such openings shall be placed so as to provide cross ventilation of the under-floor space.

**1203.3.1 Openings for under-floor ventilation.** The minimum net area of ventilation openings shall not be less than 1 square foot for each 150 square feet (0.09 m<sup>2</sup> for each 13.9 m<sup>2</sup>) of crawl-space area. Ventilation openings shall be covered for their height and width with any of the following materials, provided that the least dimension of the covering shall not exceed 1/4 inch (6.4 mm):

1. Perforated sheet metal plates not less than 0.070 inch (1.8 mm) thick.
2. Expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick.
3. Cast-iron grilles or gratings.
4. Extruded load-bearing vents.
5. Hardware cloth of 0.035 inch (0.89 mm) wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not exceeding  $\frac{1}{8}$  inch (3.2 mm).

**1203.3.2 Exceptions.** The following are exceptions to Sections 1203.3 and 1203.3.1:

1. Where warranted by climatic conditions, ventilation openings to the outdoors are not required if ventilation openings to the interior are provided.
2. The total area of ventilation openings is permitted to be reduced to 1/1,500 of the under-floor area where the ground surface is covered with a Class I vapor retarder material and the required openings are placed so as to provide cross ventilation of the space. The installation of operable louvers, in accordance with Section 1203.3.1, shall not be prohibited.
3. Ventilation openings are not required where continuously operated mechanical ventilation is provided at a rate of 1.0 cubic foot per minute (cfm) for each 50 square feet (1.02 L/s for each 10 m<sup>2</sup>) of crawl space floor area and the ground surface is covered with a Class I vapor retarder.
4. Ventilation openings are not required when the ground surface is covered with a Class I vapor retarder, the perimeter walls are insulated and the space is conditioned in accordance with the *New York City Energy Conservation Code*.
5. For buildings in areas of special flood hazard, the openings for under-floor ventilation shall also comply with Appendix G.

**1203.4 Natural ventilation.** Natural ventilation of occupiable and habitable space shall be through openings to the outdoors. The openings shall be of a type permitted under Sections 1203.4.1.1, 1203.4.1.2, 1203.4.1.3 and 1203.4.1.4. The operating mechanism for such openings shall be provided with ready access so that the openings are readily controllable by the building occupants.

**Exception:** An opening providing the required dimensional operable area shall be permitted to be reduced by limiting devices in accordance with the *New York City Health Code*, provided that the owner shall remove such limiting devices where requested by the occupant. In such cases, where required by the *New York City Health Code*, alternative means of compliance shall be provided in accordance with the *New York City Health Code*.

**1203.4.1 Ventilation area required.** Ventilation areas shall be as set forth in Sections 1203.4.1.1 through 1203.4.1.4.

**1203.4.1.1 Occupiable spaces.** Where occupiable spaces are not required to be provided with mechanical ventilation in accordance with the *New York City Mechanical Code*, natural ventilation shall be provided in accordance with Section 1203.4.1.1. Openings providing required natural ventilation to occupiable spaces shall be windows, doors, louvers, skylights or other similar ventilating openings.

**Exceptions:**

1. Bathrooms and toilet rooms in R or I-1 occupancies shall comply with Section 1203.4.1.3.
2. Kitchenettes in R or I-1 occupancies shall comply with Section 1203.4.1.4.

**1203.4.1.1.1 Minimum opening.** The minimum openable area to the outdoors shall be 4 percent of the floor area of the occupiable space being ventilated.

**1203.4.1.1.2 Adjoining spaces.** Where occupiable rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining room shall be unobstructed and shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 25 square feet (2.3 m<sup>2</sup>). The minimum openable area to the outdoors shall be based on the total floor area being ventilated.

**Exception:** Exterior openings required for ventilation shall be permitted to open into a sunroom or covered patio provided that the openable area between such sunroom addition or covered patio and the interior room shall have an area of not less than 8 percent of the floor area of the interior room or space, but not less than 20 square feet (1.9 m<sup>2</sup>). The minimum openable area to the outdoors shall be based on the total floor area being ventilated.

**1203.4.1.1.3 Openings below grade.** Where openings below grade provide required natural ventilation, the outside horizontal clear space measured perpendicular to the opening shall be one and one-half times the depth of the opening. The depth of the opening shall be measured from the average adjoining ground level to the bottom of the opening.

**1203.4.1.1.4 Mezzanines.** Where an interior balcony or mezzanine opens to form part of another room or space, its area shall be added to the area of the room or space in which it is located to compute the ventilation required for both spaces.

**1203.4.1.2 Habitable spaces.** All habitable spaces shall be provided with natural ventilation in accordance with Section 1203.4.1.2. Openings providing required natural ventilation to habitable spaces shall be windows and/or glazed doors.

**Exception:** R-3 occupancies. Openable skylights opening directly to the outer air, transparent or translucent panels, or other natural light-transmitting media may be substituted for window openings

in R-3 occupancies provided that they meet the minimum dimensional requirements of Section 1203.4.1.2.1.

**1203.4.1.2.1 Minimum opening.** The minimum openable area to the outdoors shall be 5 percent of the floor area of the habitable space being ventilated. Every opening providing required natural ventilation shall be at least 12 square feet (1.1 m<sup>2</sup>) of glazed area, providing a minimum of 6 square feet (0.56 m<sup>2</sup>) of openable area.

**Exceptions:**

1. Where fresh air is furnished in any habitable room or space by mechanical means supplying a minimum of 40 cubic feet per minute (0.02 m<sup>3</sup>/s), the free openable area of the openings may be reduced to 2½ percent of the floor area but each such opening shall provide not less than 5½ square feet (0.51 m<sup>2</sup>) of openable area.
2. The minimum free openable area of a mul-lioned casement window shall be 5½ square feet (0.51 m<sup>2</sup>), provided that the minimum ratio of floor area to openable area is met.

**1203.4.1.2.2 Adjoining spaces.** An alcove or room opening off another room or space shall be considered as a separate room in determining its requirements for ventilation.

**Exceptions:**

1. **Alcoves within R-3 dwelling units.** In R-3 occupancies, where an opening between the alcove and the room or space is at least 80 percent of the area of the common wall and the floor area of the alcove does not exceed twice the area of the opening, the alcove and the room opening into the alcove may be considered as a single space.
2. **Balconies, partially enclosed.** Exterior openings required for ventilation shall be permitted to open upon a partially enclosed balcony or space above a setback when:
  - 2.1. Such balcony or space faces upon a public street, space, alley, park, highway, or right of way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206;
  - 2.2. The maximum depth of any habitable room is 30 feet (9144 mm) measured from the outer face of the exterior wall forming the partial or full enclosure of the balcony or space;
  - 2.3. The enclosure of the balcony or space is not more than one story in height; and

2.4. The front of a partially enclosed balcony or space above a setback shall be open to the outer air with an open area equal to at least 75 percent of the floor surface area of such balcony or space.

3. **Balconies, fully enclosed.** Exterior openings required for ventilation shall be permitted to open upon a fully enclosed balcony or space above a setback, including sunroom and patio covers, when:

- 3.1. Such balcony or space faces upon a public street, space, alley, park, highway, or right of way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206;
- 3.2. The maximum depth of any habitable room is 30 feet (9144 mm) measured from the outer face of the exterior wall forming the partial or full enclosure of the balcony or space;
- 3.3. The enclosure of the balcony or space is not more than one story in height;
- 3.4. The building is Type I or II construction;
- 3.5. The outer enclosing walls of the balcony or space are glazed with an area at least 50 percent of the area of the interior enclosing walls of such balcony or space; the glazing may be clear plate glass or slow burning plastic;
- 3.6. At least 50 percent of the glazed area required by Exception 3.5 of this section is openable; and
- 3.7. No window from any bathroom, toilet room, kitchen or kitchenette shall open on such balcony or space.

4. **Mezzanines and split-level rooms.** Where a habitable mezzanine or portion of a split-level room or space is not directly served by an opening providing natural ventilation in accordance with Section 1203.4.1.2, such mezzanine or space shall open for its full width with no obstruction, except for railings, to an adjoining habitable room which is provided with natural ventilation. The floor area of such mezzanine or portion of the split-level room or space shall be added to the floor area of the adjoining room to compute the required ventilation in accordance with Section 1203.4.1.2.1. The combined space shall also comply with Section 1203.4.1.2.4. When required natural ventilation is not



provided, mechanical ventilation shall be provided to the mezzanine and split-level rooms in accordance with the *New York City Mechanical Code* capable of providing 2 cubic feet per minute (0.00094 m<sup>3</sup>/s) of fresh air per square foot (0.09 m<sup>2</sup>) of floor area of mezzanine.

**1203.4.1.2.3 Basements and cellars.** Where openings provide natural ventilation to habitable spaces located in basements or cellars, such opening shall also comply with the applicable provisions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.

**1203.4.1.2.4 Maximum depth of room.** No part of any room shall be more than 30 feet (9144 mm) from a window opening onto a street or yard unless such room also opens onto a court complying with Section 1206.

**Exception:** In dwelling units containing more than three habitable rooms in Group R-1 or R-2 occupancies in buildings of Type I or II construction, rooms may be greater than 30 feet (9144 mm) in depth provided that all other requirements of Section 1203.4.1.2 are met and that the required windows are so located as to properly light all portions of the room in accordance with Section 1205.

**1203.4.1.3 Bathrooms and toilet rooms in R and I-1 occupancies.** Bathrooms or toilet rooms in R or I-1 occupancies shall be provided with natural ventilation in accordance with Section 1203.4.1.3, unless provided with exhaust ventilation in accordance with the *New York City Mechanical Code*. Openings providing required natural ventilation shall be windows.

**Exception:** Openable skylights may be substituted for windows provided that the bathroom or toilet room is on the top story.

**1203.4.1.3.1 Minimum opening.** The minimum openable area to the outdoors shall be 5 percent of the floor area of the space being ventilated. Every window or skylight providing required natural ventilation shall be at least 3 square feet (0.28 m<sup>2</sup>) providing a minimum of 1½ square feet (0.14 m<sup>2</sup>) of openable area.

**1203.4.1.3.2 Adjoining spaces.** Natural ventilation for bathrooms and toilet rooms may not be through openings from another room or space.

**Exception:** A bathroom or toilet room may open onto a partially enclosed balcony or space above a setback conforming with Exception 2 of Section 1203.4.1.2.2.

**1203.4.1.3.3 Basements and cellars.** Where openings provide natural ventilation to bathrooms or toilet rooms located in basements or cellars, such opening shall also comply with the applicable provisions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.

visions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.

**1203.4.1.4 Kitchenettes in R and I-1 occupancies.** Kitchenettes in R or I-1 occupancies shall be provided with natural ventilation in accordance with Section 1203.4.1.4, unless provided with exhaust ventilation in accordance with the *New York City Mechanical Code*. Openings providing required natural ventilation shall be windows.

**Exception:** Openable skylights may be substituted for windows provided that:

1. The kitchenette is on the top story;
2. The skylight is 12 inches (305 mm) in its least dimensions;
3. The skylight is at least 4 square feet (0.37 m<sup>2</sup>) or one-eighth of the area of the kitchenette, whichever is greater; and
4. The skylight provides ventilating openings for at least one-half of its area.

**1203.4.1.4.1 Minimum opening.** The minimum openable area to the outdoors shall be 5 percent of the floor area of the space being ventilated. Every window or other opening providing required natural ventilation shall be at least 1 foot (305 mm) wide and at least 3 square feet (0.28 m<sup>2</sup>) in total area, providing a minimum of 1½ square feet (0.14 m<sup>2</sup>) of openable area.

**Exception:** Skylights shall comply with the exception of Section 1203.4.1.4.

**1203.4.1.4.2 Adjoining spaces.** Natural ventilation for kitchenettes shall not be through openings off another room or space.

**Exception:** A kitchenette may open onto a partially enclosed balcony or space above a setback conforming with Exception 2 of Section 1203.4.1.2.2.

**1203.4.1.4.3 Basements and cellars.** Where openings provide natural ventilation to kitchenettes less than 80 square feet (7.4 m<sup>2</sup>) located in basements or cellars, such opening shall also comply with the applicable provisions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.

**1203.4.2 Contaminants exhausted.** Contaminant sources in naturally ventilated spaces shall be removed in accordance with the *New York City Mechanical Code*.

**1203.4.2.1 Bathrooms.** Rooms containing bathtubs, showers, spas and similar bathing fixtures in other than R and I-1 occupancies shall be mechanically ventilated in accordance with the *New York City Mechanical Code*, whether or not they are also provided with natural ventilation.

**1203.4.3 Openings on yards or courts.** Natural ventilation shall be provided by openings to a public street, space, alley, park, highway, or right-of-way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206. No such opening shall be on a recess of less than 6 feet (1829 mm) in width.

**Exceptions:**

1. Openings providing natural ventilation to habitable spaces located in basements or cellars shall also comply with the applicable provisions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.
2. A kitchenette, a bathroom, or a water closet compartment may be located on a recess of less than 6 feet (1829 mm) in width.

**1203.4.4 Measurement of openings.** Dimensions of windows and other openings shall always be taken between stop beads or, if there are no stop beads, between the sides, head, and sill of the sash opening.

**1203.5 Other ventilation and exhaust systems.** Ventilation and exhaust systems for occupancies and operations involving flammable or combustible hazards or other contaminant sources as covered in the *New York City Mechanical Code* or the *New York City Fire Code* shall be provided as required by both codes.

**SECTION BC 1204  
TEMPERATURE AND HUMIDITY CONTROL**

**1204.1 Equipment and systems.** Interior spaces intended for human occupancy shall be provided with active or passive space-heating systems capable of maintaining a minimum indoor temperature as indicated in Table 1204.1 at a point 3 feet (914 mm) above the finished floor. The heating capacity of heat-producing devices and equipment which are contained in the room and in constant use during occupancy may be deducted from the capacity of the heating system. Portable heating systems shall not be considered as contributing to the capacity of the heating system.

**Exception:** Where specific rooms or spaces are not listed, the temperature shall be determined by the requirements of the listed space to which they most nearly conform or as determined by the registered design professional.

**1204.2 Air conditioning.** Interior spaces intended for human occupancy that are provided with air conditioning shall be provided with active or passive systems that are capable of maintaining 78°F (26°C) at 50-percent relative humidity when the outdoor air temperature is 89°F (32°C) and the coincident wet bulb temperature is 73°F (23°C). Interior spaces without air conditioning shall be provided with mechanical or natural ventilation in compliance with other subsections of this code.

**1204.3 Freeze protection.** All interior spaces shall be provided with active or passive systems or with methods of construction capable of preventing wet piping systems and

**TABLE 1204.1  
MINIMUM SPACE TEMPERATURE REQUIREMENTS<sup>a</sup>**

ROOMS OR SPACES	MINIMUM TEMPERATURE (°F)
Habitable rooms in all buildings	68
Building equipment and machinery rooms	50
Patients' rooms, bathrooms and toilet rooms, stairs and corridors in hospitals and nursing homes	As per the <i>New York State Health Code</i>
Bathrooms and toilet rooms except patients' bathrooms and toilet rooms in hospitals and nursing homes	68
Offices, waiting rooms, art galleries, museums, libraries, meeting rooms, houses of worship, classrooms, auditoriums, lecture halls, nightclubs, restaurants, theatres, locker rooms, dressing rooms, and spaces where persons are engaged in sedentary activities	68
Laboratories, light machine work, product inspections, loft buildings, shops, stores, display rooms, show rooms, sales rooms, and spaces where persons are engaged in moderate physical activities	65
Gymnasias, dance halls, skating rinks, bowling alleys, heavy assembly workrooms or shops, and spaces where persons are engaged in vigorous physical activities	60
Automotive repair shops	50
Storage areas, garages, space where work or process requires a low temperature	None
Hospital operating rooms, and recovery, labor, delivery, and nursery rooms	As per the <i>New York State Health Code</i>
Swimming pools, bath houses, and shower rooms	75

a. Temperatures listed here are the minimum requirements of the department. However, other jurisdictional authorities may have more stringent requirements.

**Exceptions:**

1. Heating systems are not required when occupancy is seasonal and the rooms or buildings are not occupied between November 1st and May 1st of the following year.
2. Heating systems are not required when the processes or activities normally conducted in the space will generate sufficient heat to maintain the prescribed temperatures during the time of occupancy.
3. Spaces where strict process requirements mandate temperatures other than those cited above shall be exempt from the minimum requirements listed in Table 1204.1.

vessels from freezing at all times, including permanently installed pipe heat tracing systems.

**1204.4 System design.** The heating system and air-conditioning system, as applicable, shall be designed to provide sufficient capacity to meet the temperature and humidity requirements of Section 1204 when considering the outdoor air ventilation requirements and all losses in the system and ancillary uses, such as domestic hot water, for which the system is used. The system shall be designed and installed to meet all other applicable provisions of this code.

## SECTION BC 1205 LIGHTING

**1205.1 General.** Every room and space in every building shall be provided with artificial light in accordance with Section 1205.3. Every habitable room and space shall also be provided with natural light by means of exterior glazed openings in accordance with Section 1205.2.

**Exceptions:** Artificial light need not be provided in rooms or spaces:

1. Occupied exclusively during the daylight hours between 1 hour after sunrise and 1 hour before sunset, and which are provided with natural light meeting the requirements of Section 1205.2; or
2. With less than 40 square feet (3.7 m<sup>2</sup>) of floor area if they are used exclusively for storage purposes or for mechanical facilities containing no rotating or moving parts, no combustion equipment, or no other hazardous equipment.

**1205.2 Natural light.** Every opening providing required natural light shall be so located so as to properly light all portions of the room. Openings providing required natural light shall be windows and/or glazed doors.

**Exception:** R-3 occupancies. Skylights, opening directly to the outer air, transparent or translucent panels, or other light-transmitting media, may be substituted for window openings in R-3 occupancies provided that they meet the minimum dimensional requirements of Section 1205.2.2.

**1205.2.1 Minimum opening.** The minimum net glazed area shall not be less than 10 percent of the floor area of the room served. Every opening providing required natural light shall be at least 12 square feet (1.1 m<sup>2</sup>) of glazed area.

**1205.2.2 Adjoining spaces.** An alcove or room opening off another room or space shall be considered as a separate room in determining its requirements for natural lighting.

**Exceptions:**

1. **Alcoves within R-3 dwelling units.** In R-3 occupancies, where an opening between the alcove and the room or space is at least 80 percent of the area of the common wall and the floor area of the alcove does not exceed twice the area of the opening, the alcove and the room opening into the alcove may be considered as a single space.

**2. Balconies, partially enclosed.** Exterior openings required for natural light shall be permitted to open upon a partially enclosed balcony or space above a setback when:

- 2.1. Such balcony or space faces upon a public street, space, alley, park, highway, or right of way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206;
- 2.2. The maximum depth of any habitable room is 30 feet (9144 mm) measured from the outer face of the exterior wall forming the partial or full enclosure of the balcony or space;
- 2.3. The enclosure of the balcony or space is not more than one story in height; and
- 2.4. The front of a partially enclosed balcony or space above a setback shall be open to the outer air with an open area equal to at least 75 percent of the floor surface area of such balcony or space.

**3. Balconies, fully enclosed.** Exterior openings required for natural lighting shall be permitted to open upon a fully enclosed balcony or space above a setback, including thermally isolated sunroom additions and covered patios, when:

- 3.1. Such balcony or space faces upon a public street, space, alley, park, highway, or right of way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206;
- 3.2. The maximum depth of any habitable room is 30 feet (9144 mm) measured from the outer face of the wall forming the partial or full enclosure of the balcony or space;
- 3.3. The enclosure of the balcony or space is not more than one story in height;
- 3.4. The building is Type I or II construction;
- 3.5. The outer enclosing walls of the balcony or space are glazed with an area at least 50 percent of the area of the interior enclosing walls of such balcony or space; the glazing may be clear plate glass or slow burning plastic;
- 3.6. At least 50 percent of the glazed area required by Exception 3.5 of this section is openable; and
- 3.7. No window from any bathroom, toilet room, kitchen or kitchenette shall open on such balcony or space.

**4. Mezzanines and split-level rooms.** Where a habitable mezzanine or portion of a split-level room or space is not directly served by an opening providing natural lighting in accordance with



Section 1205.2, such space shall be open for its full width with no obstruction, except for railings, to an adjoining habitable room which is provided with such window or other opening. The floor area of the mezzanine or portion of the split level room or space shall be added to the floor area of the adjoining room to compute the required lighting in accordance with Section 1205.2.1. The combined space shall also comply with Sections 1205.2.4 and 1205.2.7.

### 1205.2.3 Basements and cellars.

**1205.2.3.1 Adequate adjacent space for multiple dwellings.** Where rooms within a dwelling unit in a multiple dwelling are located in a cellar or a basement, such rooms shall have at least one-half of their height and all of their required window surfaces above every part of an “adequate adjacent space.” Such “adequate adjacent space” shall be open to the sky and shall be a continuous surface area not less than 30 feet (9144 mm) in its least dimension abutting at same level or directly below the exterior walls of every part of the basement and cellar portions of such dwelling unit. Such “adequate adjacent space” shall be spaces that are located on the same tax lot or plot in compliance with Section 1206.1 as the building or a public street, space, alley, park, highway or right of way and the level of such areas which abut or adjoin the habitable room shall be at least 6 inches (152 mm) below the window sills of any windows.

**1205.2.3.2 Other applicable laws.** Where openings provide natural lighting to habitable spaces located in basements or cellars, such opening shall comply with the applicable provisions of Sections 27-2081 through 27-2087 of the *New York City Housing Maintenance Code* and Sections 26(8) and 34 of the *New York State Multiple Dwelling Law*.

**1205.2.4 Maximum depth of room.** No part of any room shall be more than 30 feet (9144 mm) from a window opening on a street or yard unless such room also opens onto a legal court in compliance with Section 1206.1.

**Exception:** In dwelling units containing more than three habitable rooms in R-1 or R-2 occupancies in buildings of Type I or II construction, rooms may be greater than 30 feet (9144 mm) in depth provided that all other requirements of Section 1205.2 are met and that the required windows are located so as to properly light all portions of the room.

**1205.2.5 Openings on yards or courts.** Exterior glazed openings shall open directly onto a public street, space, alley, park, highway, or right-of-way; or upon a yard, court, plaza, or space above a setback where such yard, court, plaza, or space above a setback complies with Section 1206. No such opening shall be on a recess of less than 6 feet (1829 mm) in width.

**Exception:** Spaces located in basements or cellars shall also comply with Section 1205.2.3.

**1205.2.6 Measurement of glazed areas.** Dimensions of windows and other glazed areas shall always be taken between stop beads or, if there are no stop beads, between the sides, head, and sill.

### 1205.2.7 Height of glazed areas.

**1205.2.7.1** Only that portion of glazed areas higher than 30 inches (914 mm) above the floor shall be considered as providing the required natural lighting.

**1205.2.7.2** The top of at least one window or other opening providing required natural lighting to a habitable room shall be a minimum of 7 feet (2134 mm) above the floor of the room or space served by the window or opening.

**Exception:** Mezzanines. Where the required natural lighting for a habitable mezzanine level is provided by a window(s) on the lower level in accordance with Section 1205.2.2, Exception 4, and where compliance with Section 1205.2.7.2 is not feasible on the mezzanine floor, Section 1205.2.7.2 shall not apply to such mezzanine floor provided that such window(s) is on the opposite wall from the mezzanine, and the top of such window is at least 12 inches (305 mm) above the floor of the mezzanine.

### 1205.3 Artificial light.

**1205.3.1 General.** Artificial light shall meet the minimum illumination standards set forth in Section 1205.3. Artificial light shall not exceed maximum energy consumption requirements, if applicable, as required by the *New York City Energy Conservation Code*.

**1205.3.2 Rooms and spaces.** Artificial light shall be adequate to provide an average illumination of 10 foot-candles (107 lux) over the area of the room at a height of 30 inches (762 mm) above the floor level.

**1205.3.3 Stairways.** Stairways within dwelling units and exterior stairways serving a dwelling unit shall have an illumination level on tread runs of not less than 1 foot-candle (11 lux). Stairs in other occupancies shall be governed by Chapter 10.

**1205.3.4 Means of egress.** The means of egress shall be illuminated in accordance with Section 1006.1. Exterior lights near entranceways to multiple dwellings shall also comply with Section 27-2040 of the *New York City Housing Maintenance Code*.

**1205.3.5 Places of assembly.** Places of assembly shall be illuminated in accordance with Chapter 10.

### 1205.4 Reserved.

### 1205.5 Reserved.

## SECTION BC 1206 YARDS AND COURTS

**1206.1 General.** This section shall apply to yards and courts adjacent to exterior openings that provide required natural light or required natural ventilation. Such yards and courts



shall be on the same zoning lot as the building. Where such yard or court is wholly or partially on a different tax lot from the exterior opening which the yard or court serves, a light and air easement or restrictive declaration acceptable to the commissioner shall be recorded against the tax lot or lots where such yard or court is located.

**1206.2 Yards.** Yards shall not be less than the dimensions prescribed by the *New York City Zoning Resolution* and other applicable laws, rules, and regulations.

**1206.2.1 Rear yard access for multiple dwellings.** For multiple dwellings, there shall be direct access from the street to every rear yard through a noncombustible 2-hour fire-resistance-rated passage either in a direct line or through a court, except that the passage may be 1-hour fire-resistance-rated for dwellings not exceeding three stories in height and occupied by not more than two families on any story. Such passage shall be at least 36 inches (914 mm) in clear width and 7 feet (2134 mm) in height.

**Exceptions:** No such passage shall be required for:

1. Buildings of Type IA or IB construction.
2. Buildings not exceeding three stories in height, and occupied by not more than one family on any story nor more than three families in all.
3. Buildings not exceeding two stories in height, and occupied by not more than two families on any story nor more than four families in all.

**1206.3 Courts.** Courts shall not be less than the dimensions prescribed by the *New York City Zoning Resolution* and other applicable laws, rules and regulations.

**1206.3.1 Court access.** Access shall be provided to the bottom of courts for cleaning purposes.

**1206.3.2 Air intake.** Courts more than two stories in height shall be provided with a horizontal air intake at the bottom not less than 10 square feet (0.93 m<sup>2</sup>) in area and leading to the exterior of the building unless abutting a yard or public way.

**Exception:** For multiple dwellings more than two stories in height, an air intake with a vertical cross-sectional area of 21 square feet (1.95 m<sup>2</sup>) and a least minimum dimension of 3 feet (914 mm) shall be provided at or near the lowest level of any court, in accordance with Section 26(7)(a) of the *New York State Multiple Dwelling Law*.

**1206.3.3 Court drainage.** The bottom of every court shall be properly graded and drained to a public sewer or other approved disposal system complying with the *New York City Plumbing Code*. For Group R and I-1 occupancies, such grading and drainage shall also comply with Section 27-2027 of the *New York City Housing Maintenance Code*. For R-1, R-2 and I-1 occupancies, such grading and drainage shall also comply with Section 77 of the *New York State Multiple Dwelling Law*.

**1206.3.4 Court walls for multiple dwellings.** All walls enclosing courts of multiple dwellings shall be of light colored materials or shall be painted a light color.

**Exceptions:**

1. Outer courts that open to a street.
2. Courts that exceed the minimum dimension set forth in the *New York City Zoning Resolution* by at least 50 percent.

**1206.4 Lighting in courts and yards.** In Group I-1, R-1 or R-2 occupancies, all yards and courts shall be artificially illuminated with a minimum intensity of not less than 1 foot-candle (11 lux) measured 30 inches (762 mm) above the floor of the lowest level of such yards or courts.

**Exception:** Such lighting is not required in an inner court that is accessible only from the interior of the building and to which access is restricted for clean-out purposes.

## SECTION BC 1207 SOUND TRANSMISSION

**1207.1 Scope.** This section shall apply to common interior walls, partitions and floor/ceiling assemblies between adjacent dwelling units, between dwelling units and adjacent mechanical equipment spaces, or between dwelling units and adjacent occupancies, and public areas such as halls, corridors, stairs or service areas.

**1207.2 Air-borne sound.** Walls, partitions and floor/ceiling assemblies separating dwelling units from each other, from adjacent occupancies, from public or service areas, from stairs or from mechanical equipment spaces, including boiler rooms, or elevator or other shafts shall have a sound transmission class (STC) for air-borne noise of not less than 50 based upon laboratory measurements made in accordance with ASTM E 90, or not less than 45 if field tested in accordance with ASTM E 336. Dwelling unit entrance doors shall be installed of assemblies having an STC of not less than 30 based upon laboratory measurements made in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings.

**1207.2.1 Masonry.**† The sound transmission class of concrete masonry and clay masonry assemblies shall be calculated in accordance with TMS 0302 or determined through testing in accordance with ASTM E 90.

**TABLE 1207.2.1**  
**MAXIMUM SOUND PRESSURE LEVELS FOR MACHINE ROOMS**  
**ADJACENT TO DWELLING UNITS, MEASURED IN THE**  
**DWELLING UNIT**

OCTAVE BANDS, HZ MID-FREQUENCY	MAXIMUM SOUND PRESSURE LEVEL db <sup>a</sup>
	db re 0.0002 microbars
63	61
125	53
250	46
500	40
1000	36
2000	34
4000	33
8000	32

a. The maximum sound pressure levels shall be reduced five db in any octave band where the equipment data indicate pure tone generation. The presence of pure tones may be determined by means of one-third octave band analysis. The criterion for a significant pure tone component shall be an audible pure-tone sound together with an increase of the sound pressure level in the corresponding one-third octave band above the mean of the two adjacent one-third of at least:

Center frequency of one-third octave band:	40/125	160/250	215/500	630/1,000	1,000/10,000
Increase in sound pressure level (db):	6	4	3	2	1½

**1207.2.2 Machine and equipment rooms.** Elevator machine rooms and machinery spaces containing equipment totaling more than 75 rated h.p. shall not be located vertically or horizontally adjacent to dwelling units unless the total sound pressure level output of all the equipment in the machine room or space is certified not to exceed the maximum sound pressure levels of Table 1207.2.1 in any octave band.

**1207.3 Structure-borne sound.** Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area stair, exterior mechanical equipment, or other mechanical equipment space, including boiler rooms, shall be constructed of assemblies having an impact insulation class (IIC) rating of not less than 50 based upon laboratory measurements made in accordance with ASTM E 492, or not less than 45 if field tested in accordance with ASTM E 1007 in completed construction. See Chapter 30 for additional sound control requirements for elevator machinery.

**1207.3.1 Refuse chutes.** Metal refuse chutes, metal chute supports, and/or metal chute bracing shall be free of direct contact with the shaft enclosure and the openings provided in the floor construction. Metal chutes shall be resiliently supported at each structural support location. Isolators shall provide a minimum static deflection of 0.3 inches (7.62 mm). All chutes shall be plumb.

**1207.4 Field testing.** Where conditions indicate that the installed construction or equipment does not meet the noise

control prescribed in Section 1207, measurements shall be taken to determine conformance or nonconformance.

## SECTION BC 1208

### INTERIOR SPACE DIMENSIONS

**1208.1 Minimum room widths.** Habitable spaces, other than a kitchen, shall not be less than 8 feet (2438 mm) in any plan dimension. Kitchens and kitchenettes shall have a clear passageway of not less than 3 feet (914 mm) between counter fronts and appliances or counter fronts and walls.

#### Exceptions:

1. A room that complies with the requirements for natural light and natural ventilation and in addition has an unobstructed opening of not less than 60 square feet (5.6 m<sup>2</sup>) into an immediately adjoining room shall not be less than 7 feet (2134 mm) in any plan dimension.
2. A habitable dining space that complies with the requirements for natural light and natural ventilation may be less than 8 feet (2438 mm) in any plan dimension.
3. One-half the number of bedrooms in a dwelling unit containing three or more bedrooms shall not be less than 7 feet (2134 mm) in any plan dimension.
4. A room in a Group R-1 dwelling or sleeping unit shall not be less than 6 feet (1829 mm) in any plan dimension.

**1208.2 Minimum ceiling heights.** Habitable rooms and spaces shall have a ceiling height of not less than 8 feet (2438 mm). Occupiable spaces and corridors shall have a ceiling height of not less than 7 feet 6 inches (2286 mm). Bathrooms, toilet rooms, kitchens in other than I-1 and R occupancies, kitchenettes in I-1 or R occupancies, storage rooms and laundry rooms shall be permitted to have a ceiling height of not less than 7 feet (2134 mm). All measurements shall be taken from the finished floor to the finished underside of the ceiling or ceiling beams.

#### Exceptions:

1. In one- and two-family dwellings, beams or girders spaced not less than 4 feet (1219 mm) on center may project not more than 6 inches (152 mm) below the required ceiling height, provided that a clear height of 7 feet (2134 mm) is maintained.
2. Habitable rooms in basements of one-family dwellings, including any projecting beams, shall have a ceiling height of not less than 7 feet (2134 mm).
3. Habitable rooms in basements of multiple dwellings may have as many as four beams crossing the ceiling if none of the beams exceeds 12 inches (305 mm) in width or extends below the ceiling more than 6 inches (152 mm).
4. Spaces above and below a mezzanine, other than habitable spaces, shall have a ceiling height of not less than 7 feet (2134 mm).

**1208.2.1 Furred ceiling.** Any room with a furred ceiling shall be required to have the minimum ceiling height in two-thirds of the area thereof, but in no case shall the height of the furred ceiling be less than 7 feet (2134 mm).

**Exception:** Minimum ceiling heights of habitable rooms and spaces shall not be less than established in Section 1208.2.

**1208.3 Room area.** Minimum net floor areas of rooms shall be in accordance with Sections 1208.3.1 and 1208.3.2.

**1208.3.1 Habitable rooms and spaces.** Every habitable room or space shall have not less than 80 square feet (7.4 m<sup>2</sup>) in net floor area.

**Exceptions:**

1. A room that complies with the requirements for natural light and natural ventilation and in addition has an unobstructed opening of not less than 60 square feet (5.6 m<sup>2</sup>) into an immediately adjoining room shall have not less than 70 square feet (6.5 m<sup>2</sup>) of net floor area.
2. A habitable dining space, as defined by the *New York City Housing Maintenance Code*, that complies with the requirements for natural light and natural ventilation may have less than 80 square feet (7.4 m<sup>2</sup>) of net floor area.
3. A room in a Group R-1 dwelling unit shall have not less than 60 square feet (5.6 m<sup>2</sup>) of net floor area.

**1208.3.2 Dwelling units.** In a dwelling unit, at least one habitable room shall have not less than 150 square feet (13.9 m<sup>2</sup>) of net floor area.

**Exception:** Group R-1 dwelling or sleeping units.

**1208.3.2.1 Single room occupancy of a single room.** Where a single room within a dwelling unit is used for single room occupancy, as such term is used in Section 27-2074(e) of the *New York City Housing Maintenance Code*, such room shall have not less than 150 square feet (13.9 m<sup>2</sup>) of net floor area.

**1208.3.2.2 Single room occupancy of a suite of rooms.** Where two or more rooms, joined together and separated from all other rooms within a dwelling unit, are used for single room occupancy, as such term is used in Section 27-2074(e) of the *New York City Housing Maintenance Code*, at least one of such separated rooms shall have not less than 150 square feet (13.9 m<sup>2</sup>) of net floor area.

**1208.4 Reserved.**

**SECTION BC 1209  
ACCESS TO UNOCCUPIED SPACES**

**1209.1 Crawl spaces.** Crawl spaces shall be provided with a minimum of one access opening not less than 18 inches by 24 inches (457 mm by 610 mm). All crawl spaces shall have a minimum clear height of 18 inches (457 mm).

**1209.2 Attic spaces.** An opening not less than 20 inches by 30 inches (508 mm by 762 mm) shall be provided to any attic area having a clear height of over 30 inches (762 mm). A 30-inch (762 mm) minimum clear headroom in the attic space shall be provided at or above the access opening.

**1209.3 Mechanical appliances.** Access to mechanical appliances installed in under-floor areas, in attic spaces and on roofs or elevated structures shall be in accordance with the *New York City Mechanical Code*.

**SECTION BC 1210  
SURROUNDING MATERIALS**

**1210.1 Floors and wall base finish materials.** Toilet, bathing, and shower room floor finish materials shall have a smooth, hard, nonabsorbent surface. The intersections of such floors with walls shall have a smooth, hard, nonabsorbent vertical base that extends upward onto the walls at least 4 inches (101.6 mm).

**Exception:** Occupancy Classes I-1, R-1 and R-2 shall have a vertical base that extends upward onto walls at least 6 inches (152 mm).

**1210.2 Walls and partitions.** Walls and partitions within 2 feet (610 mm) of urinals and water closets shall have a smooth, hard, nonabsorbent surface, to a height of 4 feet (1219 mm) above the floor, and except for structural elements, the materials used in such walls shall be of a type that is not adversely affected by moisture.

**Exceptions:**

1. Dwelling units.
2. Toilet rooms that are not accessible to the public and which have not more than one water closet.

Accessories such as grab bars, towel bars, paper dispensers and soap dishes, provided on or within walls, shall be installed and sealed to protect structural elements from moisture.

**1210.3 Showers.** Shower compartments and walls above bathtubs with installed shower heads shall be finished with a smooth, nonabsorbent surface to a height not less than 70 inches (1778 mm) above the drain inlet.

**1210.4 Waterproof joints.** Built-in tubs with showers shall have waterproof joints between the tub and adjacent wall.

**1210.5 Toilet rooms.** Toilet rooms shall not open directly into a room used for the preparation of food for service to the public. In multiple dwellings no toilet room or bathroom shall open onto any kitchen or kitchenette.

**SECTION BC 1211  
KITCHENS AND KITCHENETTES**

**1211.1 Sleeping.** No kitchen or kitchenette shall be occupied for sleeping purposes.

**1211.2 Kitchenettes in multiple dwellings.** Except at entrances thereto, every kitchenette in a multiple dwelling shall be surrounded by partitions extending from floor to



ceiling, and/or by a soffit dropped 1 foot (305 mm) from the ceiling.

## SECTION BC 1212 RODENT-PROOFING

**1212.1 General.** Rodent-proofing shall be in accordance with Appendix F.

## SECTION BC 1213 REFUSE AND RECYCLABLE STORAGE

**1213.1 General.** Multiple dwellings shall comply with Section 81 of the *New York State Multiple Dwelling Law* and Section 27-2021 of the *New York City Housing Maintenance Code*. In Group R-2 occupancies, space shall be provided for the storage of refuse and recyclables as a common accessory space. The location of such refuse and recyclables storage space shall be clearly identified on the construction documents and configured to permit separate unobstructed access by building personnel to stored refuse and recyclables. Such refuse and recyclables storage space shall be a minimum of 1.5 square feet (0.140 m<sup>2</sup>) per dwelling unit, or a minimum of 350 square feet (32.516 m<sup>2</sup>), whichever is less, for the storage of collected refuse and recyclables.

### Exceptions:

1. In multiple dwellings required to have a compactor in accordance with Section 1213.2, such refuse and recyclables storage space shall be, in addition to space required for equipment or circulation, a minimum of 1.0 square foot (0.094 m<sup>2</sup>) per dwelling unit, or a minimum of 350 square feet (32.516 m<sup>2</sup>), whichever is less, for the storage of collected refuse and recyclables.
2. Refuse and recyclables storage space shall not be required in multiple dwellings equipped with a chute system that provides for source separation of refuse and recyclable materials without cross contamination and an integrated mechanical system to transport such materials off-site that has been approved by the commissioner.

**1213.1.1 Interior space.** Where an interior room is provided for the storage of refuse and recyclables, such room shall be completely enclosed by construction that has a fire-resistance rating of not less than 2 hours, with self-closing opening protective having a fire protection rating of not less than 1½ hours.

**1213.1.2 Exterior space.** Where space is provided on the exterior of a building for the storage of refuse and recyclables, such refuse and recyclables storage space shall include a minimum of 4 square feet (0.372 m<sup>2</sup>) in addition to the space per dwelling unit required by Section 1213.1, shall be clearly identified on the construction documents, and shall not be located in the public right-of-way.

**1213.2 Compactor.** A refuse compacting system shall be provided in multiple dwellings in a Group I-1 or R-2 occupancy that are four or more stories in height and contain 12 or more dwelling units, and in buildings of any size occupied

as a Group R-1 multiple dwelling. Such system shall be located within a refuse storage room constructed in accordance with Section 1213.1 or in a refuse chute termination room constructed in accordance with Section 707.13.4. The floor within such room shall be constructed of concrete and shall be sloped to a floor drain connected to the building sewer. A hose connection shall be provided within such room.

**1213.3 Refuse chute.** A multiple dwelling that is five or more stories in height and that contains more than 9 or more dwelling units shall be provided with a refuse chute, refuse chute access rooms, and refuse chute termination room constructed in accordance with Section 707.13. A minimum of 5 square feet (0.470 m<sup>2</sup>) of floor area within each refuse chute access room shall be provided for the temporary holding of recyclables. Such floor area shall be clearly identified on the construction documents. In I-1 and R-1 occupancies, access to the chute access room shall be permitted to be restricted to employees provided that separate refuse storage rooms are located on each story for general occupant use.

### Exceptions:

1. In buildings without an elevator, floor area within refuse chute access rooms for the temporary holding of recyclables is not required.
2. In buildings equipped with separate chutes designated for refuse, for paper and cardboard, and for metal, glass and plastic, and in buildings equipped with a chute system that provides for source separation of recyclable materials without cross contamination, floor area within refuse chute access rooms for the temporary holding of recyclables is not required. Chutes for designated recyclable materials shall be constructed in accordance with Section 707.13 of this code.
3. The refuse chute and the occupant use storage rooms shall not be required in transient hotels meeting the following requirements:
  - 3.1. the refuse is removed from rooms by a daily cleaning service, with the staff using a service elevator that is not accessed by hotel guests;
  - 3.2. the building is of Group I or Group II construction; or
  - 3.3. a compactor and refuse storage room is provided in accordance with Section 1213.2.

**1213.3.1 Refuse chute access room floor and wall base finish materials.** Refuse chute access rooms shall have a smooth, hard and nonabsorbent surface. The intersection of such floors with walls shall have a smooth, hard and nonabsorbent vertical base that extends upward onto the walls at least 4 inches (101.6 mm).





## CHAPTER 13

# ENERGY EFFICIENCY

### SECTION BC 1301 GENERAL

**1301.1 Scope.** This chapter governs the design and construction of buildings for energy efficiency.

**NYC 1301.1.1 Criteria.** Buildings shall be designed and constructed in accordance with the *New York City Energy Conservation Code*.



## CHAPTER 14

# EXTERIOR WALLS

### SECTION BC 1401 GENERAL

**1401.1 Scope.** The provisions of this chapter shall establish the minimum requirements for exterior: walls; wall coverings; wall openings; windows and doors; architectural trim; balconies; projections; and other appendages.

### SECTION BC 1402 DEFINITIONS

**1402.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**ADHERED MASONRY VENEER.** Veneer secured and supported through the adhesion of an approved bonding material applied to an approved backing.

**ANCHORED MASONRY VENEER.** Veneer secured with approved mechanical fasteners to an approved backing.

**BACKING.** The wall or surface to which the veneer is secured.

**CURTAIN WALL.** A curtain wall or panel wall system is a nonload-bearing building wall, in skeleton frame construction attached and supported to the structure at every floor or other periodic locations. Assemblies may include glass, metal, precast concrete or masonry elements arranged so as not to exert common action under load and to move independently of each other and the supporting structure.

**EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS).** EIFS are nonstructural, nonload-bearing, exterior wall cladding systems that consist of an insulation board attached either adhesively or mechanically, or both, to the substrate, an integrally reinforced base coat and a textured protective finish coat.

**EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) WITH DRAINAGE.** An EIFS that incorporates a means of drainage applied over a water-resistive barrier.

**EXTERIOR WALL.** A wall, bearing or nonbearing, that is used as an enclosing wall for a building, other than a fire wall, and that has a slope of 60 degrees (1.05 rad) or greater with the horizontal plane.

**EXTERIOR WALL COVERING.** A material or assembly of materials applied on the exterior side of exterior walls for the purpose of providing a weather-resisting barrier, insulation or for aesthetics, including but not limited to, veneers, siding, exterior insulation and finish systems, architectural trim and embellishments such as cornices, soffits, facias, gutters and leaders.

**EXTERIOR WALL ENVELOPE.** A system or assembly of exterior wall components, including exterior wall finish materials, that provides protection of the building structural members, including framing and sheathing materials, and

conditioned interior space, from the detrimental effects of the exterior environment.

**FIBER CEMENT SIDING.** A manufactured, fiber-reinforcing product made with an inorganic hydraulic or calcium silicate binder formed by chemical reaction and reinforced with discrete organic or inorganic nonasbestos fibers, or both. Additives that enhance manufacturing or product performance are permitted. Fiber cement siding products have either smooth or textured faces and are intended for exterior wall and related applications.

**METAL COMPOSITE MATERIAL (MCM).** A factory-manufactured panel consisting of metal skins bonded to both faces of a plastic core.

**METAL COMPOSITE MATERIAL (MCM) SYSTEM.** An exterior wall covering fabricated using MCM in a specific assembly including joints, seams, attachments, substrate, framing and other details as appropriate to a particular design.

**VENEER.** A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counted as adding strength to the wall. Veneers are nonstructural in that they do not carry any load other than their own weight.

**VINYL SIDING.** A shaped material, made principally from rigid polyvinyl chloride (PVC) that is used as an exterior wall covering.

**WATER-RESISTIVE BARRIER.** A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior wall covering from further intruding into the exterior wall assembly.

### SECTION BC 1403 PERFORMANCE REQUIREMENTS

**1403.1 General.** The provisions of this section shall apply to exterior walls, exterior wall coverings and components thereof.

**1403.2 Weather protection.** Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing, as described in Section 1405.4. The exterior wall envelope shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer, as described in Section 1404.2 and a means for draining water that enters the assembly to the exterior. Protection against condensation shall be provided as required.

#### Exceptions:

1. A weather-resistant exterior wall envelope shall not be required over concrete and masonry walls, designed to resist water penetration and detrimental



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effects from freeze/thaw cycling and in accordance with Chapters 19 and 21, as applicable.

2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an exterior wall envelope that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E 331 under the following conditions:

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- 2.1. Exterior wall envelope test assemblies shall include at least one opening, one control joint, and where required one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.

- 2.2. Exterior wall envelope test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.

- 2.3. Exterior wall envelope assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m<sup>2</sup>) for a duration of 2 hours. The exterior wall envelope assemblies shall also be tested at a minimum differential pressure not less than 20 percent of the positive design wind load as calculated per Chapter 16, or 15 pounds per square foot (psf) (0.718 kN/m<sup>2</sup>) for a duration of 15 minutes.

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- 2.4. The exterior wall envelope design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate the test assembly including control joints in the exterior wall envelope, joints at the perimeter of openings, or intersections of terminations with dissimilar materials.

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3. Exterior insulation and finish systems (EIFS) complying with Section 1408.4.1.

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**1403.3 Structural.** Exterior wall envelope, and the associated openings, shall be designed and constructed to resist safely the superimposed loads required by Chapter 16.

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**1403.4 Fire resistance.** Exterior wall envelope shall be fire-resistance rated as required by other sections of this code with opening protection as required by Chapter 7.

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**1403.5 Flood resistance.** For buildings in areas of special flood hazard, exterior wall envelope extending below the design flood elevation shall be resistant to water damage and shall comply with Appendix G.

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**1403.6 Reserved.†**

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**1403.7 Thermal and condensation resistance.** The exterior wall envelope shall be designed and constructed as required to meet the requirements of the *New York City Energy Conservation Code*.

## SECTION BC 1404 MATERIALS

**1404.1 General.** Materials used for the construction of exterior walls shall comply with the provisions of this section. Materials not prescribed herein shall be permitted, provided that such alternative has been approved.

**1404.2 Water-resistive barrier.** A minimum of one layer of No. 15 asphalt felt, complying with ASTM D 226 for Type 1 felt, or other approved materials, shall be attached to the studs or sheathing, with flashing as described in Section 1405.4, in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer.

**1404.3 Wood.** Exterior walls of wood construction shall be designed and constructed in accordance with Chapter 23.

**1404.3.1 Basic hardboard.** Basic hardboard shall conform to the requirements of AHA A135.4.

**1404.3.2 Hardboard siding.** Hardboard siding shall conform to the requirements of AHA A135.6 and, where used structurally, shall be so identified by the label of an approved agency.

**1404.4 Masonry.** Exterior walls of masonry construction shall be designed and constructed in accordance with this chapter and Chapter 21. Masonry units, mortar and metal accessories used in anchored and adhered veneer shall meet the physical requirements of Chapter 21. The backing of anchored and adhered veneer shall be of concrete, masonry, steel framing or wood framing.

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**1404.5 Metal.** Exterior walls of formed steel construction, structural steel or lightweight metal alloys shall be designed in accordance with Chapters 22 and 20, as applicable.

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**1404.5.1 Aluminum siding.** Aluminum siding shall conform to the requirements of AAMA 1402.

**1404.5.2 Cold-rolled copper.** Copper shall conform to the requirements of ASTM B 370.

**1404.5.3 Lead-coated copper.** Lead-coated copper shall conform to the requirements of ASTM B 101.

**1404.6 Concrete.** Exterior walls of concrete construction shall be designed and constructed in accordance with Chapter 19.

**1404.7 Glass-unit masonry.** Exterior walls of glass-unit masonry shall be designed and constructed in accordance with Chapter 21.

**1404.8 Plastics.** Plastic panel, apron or spandrel walls as defined in this code shall not be limited in thickness, provided that such plastics and their assemblies conform to the requirements of Chapter 26 and are constructed of approved weather-resistant materials of adequate strength to resist the wind loads for cladding specified in Chapter 16.

**1404.9 Vinyl siding.** Vinyl siding shall be certified and labeled as conforming to the requirements of ASTM D 3679 by an approved agency.

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**1404.10 Fiber cement siding.** Fiber cement siding shall conform to the requirements of ASTM C 1186, Type A, and shall be so identified on labeling listing an approved agency.

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**NYC 1404.11 Exterior insulation finish system (EIFS).** EIFS shall be designed and constructed in accordance with Section 1408.

## SECTION BC 1405 INSTALLATION OF WALL COVERINGS

**NYC 1405.1 General.** Exterior wall coverings shall be designed and constructed in accordance with the applicable provisions of this section. Installations not prescribed herein shall be permitted, provided that such alternative has been approved. Installations shall be in accordance with approved construction documents where a permit is required. Installations of exterior wall coverings shall comply with the special inspection requirements of Chapter 17.

**NYC 1405.2 Weather protection.** Exterior wall envelope shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as approved weather coverings.

**NYC Exception:** Weather coverings not meeting the minimum nominal thicknesses specified in Table 1405.2 shall be permitted provided such alternative has been approved.

**NYC 1405.3 Vapor retarders.** Class I or II vapor retarders shall be provided on the interior side of frame walls in Zones 5, 6, 7, 8 and Marine 4.

### Exceptions:

1. Basement walls.
2. Below-grade portion of any wall.
3. Construction where moisture or its freezing will not damage materials.

**NYC 1405.3.1 Class III vapor retarders.** Class III vapor retarders shall be permitted where any one of the conditions in Table 1405.3.1 is met.

**1405.3.2† Material vapor retarder class.** The vapor retarder class shall be based on the manufacturer's certified testing or a tested assembly. The following shall be deemed to meet the class specified:

1. Class I: Sheet polyethylene, non-perforated aluminum foil.
2. Class II: Kraft-faced fiberglass batts or paint with a perm rating greater than 0.1 and less than or equal to 1.0.
3. Class III: Latex or enamel paint.

**1405.3.3† Minimum clear airspaces and vented openings for vented cladding.** For the purposes of this section, vented cladding shall include the following minimum clear airspaces:†

1. Vinyl lap or horizontal aluminum siding applied over a weather-resistive barrier as specified in this chapter.
2. Brick veneer with a clear airspace as specified in this code.
3. Other approved vented claddings.

**TABLE 1405.2  
MINIMUM THICKNESS OF WEATHER COVERINGS**

COVERING TYPE	MINIMUM THICKNESS (inches)
Adhered masonry veneer*	0.25
Aluminum siding	0.019
Anchored masonry veneer	2.625
Asbestos-cement boards	0.125
Asbestos shingles	0.156
Cold-rolled copper <sup>d</sup>	0.0216 nominal
Copper shingles <sup>d</sup>	0.0162 nominal
Exterior plywood (with sheathing)	0.313
Exterior plywood (without sheathing)	See Section 2304.6
Fiber cement lap siding	0.25 <sup>c</sup>
Fiber cement panel siding	0.25 <sup>c</sup>
Fiberboard siding	0.5
Glass-fiber reinforced concrete panels	0.375
Hardboard siding <sup>c</sup>	0.25
High-yield copper <sup>d</sup>	0.0162 nominal
Lead-coated copper <sup>d</sup>	0.0216 nominal
Lead-coated high-yield copper	0.0162 nominal
Marble slabs	1
Particleboard (with sheathing)	See Section 2304.6
Particleboard (without sheathing)	See Section 2304.6
Precast stone facing	0.625
Steel (approved corrosion resistant)	0.0149
Stone (cast artificial)	1.5
Stone (natural)	2
Structural glass	0.344
Stucco or exterior cement plaster	
Three-coat work over:	
Metal plaster base	0.875 <sup>b</sup>
Unit masonry	0.625 <sup>b</sup>
Cast-in-place or precast concrete	0.625 <sup>b</sup>
Two-coat work over:	
Unit masonry	0.5 <sup>b</sup>
Cast-in-place or precast concrete	0.375 <sup>b</sup>
Terra cotta (anchored)	1
Terra cotta (adhered)	0.25
Vinyl siding	0.035
Wood shingles	0.375
Wood siding (without sheathing) <sup>a</sup>	0.5

For SI: 1 inch = 25.4 mm.

- a. Wood siding of thicknesses less than 0.5 inch shall be placed over sheathing that conforms to Section 2304.6.
- b. Exclusive of texture.
- c. As measured at the bottom of decorative grooves.
- d. 16 ounces per square foot for cold-rolled copper and lead-coated copper, 12 ounces per square foot for copper shingles, high-yield copper and lead-coated high-yield copper.

\*Veneer units in this group shall be approved type and not be greater than 2 inches in thickness.

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**TABLE 1405.3.1**  
**CLASS III VAPOR RETARDERS**

ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: <sup>a</sup>
Marine 4	Vented cladding over OSB
	Vented cladding over plywood
	Vented cladding over fiberboard
	Vented cladding over gypsum
	Insulated sheathing with <i>R</i> -value ~ R2.5 over 2×4 wall
	Insulated sheathing with <i>R</i> -value ~ R3.75 over 2×6 wall
5	Vented cladding over OSB
	Vented cladding over plywood
	Vented cladding over fiberboard
	Vented cladding over gypsum
	Insulated sheathing with <i>R</i> -value ~ R5 over 2×4 wall
	Insulated sheathing with <i>R</i> -value ~ R7.5 over 2×6 wall
6	Vented cladding over fiberboard
	Vented cladding over gypsum
	Insulated sheathing with <i>R</i> -value ~ R7.5 over 2×4 wall
	Insulated sheathing with <i>R</i> -value ~ R11.25 over 2×6 wall
7 and 8	Insulated sheathing with <i>R</i> -value ~ R10 over 2×4 wall
	Insulated sheathing with <i>R</i> -value ~ R15 over 2×6 wall

For SI: 1 pound per cubic foot = 16 kg/m<sup>3</sup>.

a. Spray foam with a minimum density of 2 lbs/ft<sup>3</sup> applied to the interior cavity side of OSB, plywood, fiberboard, insulating sheathing or gypsum is deemed to meet the insulating sheathing requirement where the spray foam *R*-value meets or exceeds the specified insulating sheathing *R*-value.

**1405.4 Flashing.** Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect it to the exterior. Flashing shall be installed where required at the perimeters of exterior door and window assemblies, penetrations and terminations of exterior wall assemblies, exterior wall intersections with roofs, chimneys, porches, decks, balconies and similar projections and at built-in gutters and similar locations where moisture could enter the wall. Flashing with projecting flanges shall be installed on both sides and the ends of copings, under sills and continuously above projecting trim.

**1405.4.1 Exterior wall pockets.** In exterior walls of buildings or structures, wall pockets or crevices in which moisture can accumulate shall be avoided or protected with caps or drips, or other approved means shall be provided to prevent water damage.

**1405.4.2 Masonry.** Flashing and weepholes in anchored veneer shall be located in the first course of masonry above finished ground level above the foundation wall or slab, and other points of support, including structural floors, shelf angles and lintels where anchored veneers are designed in accordance with Section 1405.6.

**1405.5 Wood veneers.** Wood veneers on exterior walls of buildings of Type I, II, III and IV construction shall be not less than 1-inch (25 mm) nominal thickness, 0.438-inch (11.1 mm) exterior hardboard siding or 0.375-inch (9.5 mm) exterior-type wood structural panels or particleboard and shall conform to the following:

1. The veneer shall not exceed 40 feet (12 190 mm) in height above grade. Where fire-retardant-treated wood

is used, the height shall not exceed 60 feet (18 290 mm) in height above grade.

2. The veneer is attached to or furred from a noncombustible backing that is fire-resistance rated as required by other provisions of this code.
3. Where open or spaced wood veneers (without concealed spaces) are used, they shall not project more than 24 inches (610 mm) from the building wall.

**1405.6 Anchored masonry veneer.** Anchored masonry veneer shall comply with the provisions of Sections 1405.6, 1405.7, 1405.8, and 1405.9 and Sections 6.1 and 6.2 of TMS 402/ACI 530/ASCE 5.

**1405.6.1 Tolerances.** Anchored masonry veneers in accordance with Chapter 14 are not required to meet the tolerances in Article 3.3 G1 of TMS 602/ACI 530.1/ASCE 6.

**1405.6.2 Seismic requirements.** Anchored masonry veneer located in Seismic Design Category C or D shall conform to the requirements of Section 6.2.2.10 of TMS 402/ACI 530/ASCE 5. Anchored masonry veneer located in Seismic Design Category D shall also conform to the requirements of Section 6.2.2.10.3.3 of TMS 402/ACI 530/ASCE 5.

**1405.7 Stone veneer.** Stone veneer units not exceeding 10 inches (254 mm) in thickness shall be anchored directly to masonry, concrete or to stud construction by one of the following methods:

1. ‡With concrete or masonry backing, anchor ties shall be not less than 0.1055-inch (2.68 mm) corrosion-resistant wire, or approved equal, formed beyond the base of the backing. The legs of the loops shall be not less than 6 inches (152 mm) in length bent at right angles and laid in the mortar joint, and spaced so that the eyes or loops are 12 inches (305 mm) maximum on center (o.c.) in both directions. There shall be provided not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire tie, or approved equal, threaded through the exposed loops for every 2 square feet (0.2 m<sup>2</sup>) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length bent so that it will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.
2. ‡With stud backing, a 2-inch by 2-inch (51 by 51 mm) 0.0625-inch (1.59 mm) corrosion-resistant wire mesh with two layers of water-resistive‡ barrier in accordance with Section 1404.2 shall be applied directly to wood studs spaced a maximum of 16 inches (406 mm) o.c. On studs, the mesh shall be attached with 2-inch-long (51 mm) corrosion-resistant steel wire furring nails at 4 inches (102 mm) o.c. providing a minimum 1.125-inch (29 mm) penetration into each stud and with 8d common nails at 8 inches (203 mm) o.c. into top and bottom plates or with equivalent wire ties. There shall be not less than a 0.1055-inch (2.68 mm) corrosion-resistant wire, or approved equal, looped through the

mesh for every 2 square feet (0.2 m<sup>2</sup>) of stone veneer. This tie shall be a loop having legs not less than 15 inches (381 mm) in length, so bent that it will lie in the stone veneer mortar joint. The last 2 inches (51 mm) of each wire leg shall have a right-angle bend. One-inch (25 mm) minimum thickness of cement grout shall be placed between the backing and the stone veneer.

**1405.8 Slab-type veneer.** Slab-type veneer units not exceeding 2 inches (51 mm) in thickness shall be anchored directly to masonry, concrete or stud construction. For veneer units of marble, travertine, granite or other stone units of slab form ties of corrosion-resistant dowels in drilled holes shall be located in the middle third of the edge of the units spaced a maximum of 24 inches (610 mm) apart around the periphery of each unit with not less than four ties per veneer unit. Units shall not exceed 20 square feet (1.9 m<sup>2</sup>) in area. If the dowels are not tight fitting, the holes shall be drilled not more than 0.063 inch (1.6 mm) larger in diameter than the dowel, with the hole countersunk to a diameter and depth equal to twice the diameter of the dowel in order to provide a tight-fitting key of cement mortar at the dowel locations when the mortar in the joint has set. Veneer ties shall be corrosion-resistant metal capable of resisting, in tension or compression, a force equal to two times the weight of the attached veneer. If made of sheet metal, veneer ties shall be not smaller in area than 0.0336 by 1 inch (0.853 by 25 mm) or, if made of wire, not smaller in diameter than 0.1483-inch (3.76 mm) wire.

**1405.9 Terra cotta.** Anchored terra cotta or ceramic units not less than 1<sup>5</sup>/<sub>8</sub> inches (41 mm) thick shall be anchored directly to masonry, concrete or stud construction. Tied terra cotta or ceramic veneer units shall be not less than 1<sup>5</sup>/<sub>8</sub> inches (41 mm) thick with projecting dovetail webs on the back surface spaced approximately 8 inches (203 mm) o.c. The facing shall be tied to the backing wall with corrosion-resistant metal anchors of not less than No. 8 gage wire installed at the top of each piece in horizontal bed joints not less than 12 inches (305 mm) nor more than 18 inches (457 mm) o.c.; these anchors shall be secured to 1/4-inch (6.4 mm) corrosion-resistant pencil rods that pass through the vertical aligned loop anchors in the backing wall. The veneer ties shall have sufficient strength to support the full weight of the veneer in tension. The facing shall be set with not less than a 2-inch (51 mm) space from the backing wall and the space shall be filled solidly with Portland cement grout and pea gravel. Immediately prior to setting, the backing wall and the facing shall be drenched with clean water and shall be distinctly damp when the grout is poured.

**1405.10 Adhered masonry veneer.** Adhered masonry veneer shall comply with the applicable requirements in Section 1405.10.1 and Sections 6.1 and 6.3 of TMS 402/ACI 530/ASCE 5.

**1405.10.1 Interior adhered masonry veneers.** Interior adhered masonry veneers shall have a maximum weight of 20 psf (0.958 kg/m<sup>2</sup>) and shall be installed in accordance with Section 1405.10. Where the interior adhered masonry veneer is supported by wood construction, the supporting members shall be designed to limit deflection to 1/600 of the span of the supporting members.

**1405.11 Metal veneers.** Veneers of metal shall be fabricated from approved corrosion-resistant materials or shall be protected front and back with porcelain enamel, or otherwise be treated to render the metal resistant to corrosion. Such veneers shall not be less than 0.0149-inch (0.378 mm) nominal thickness sheet steel mounted on wood or metal furring strips or approved sheathing on the wood construction.

**1405.11.1 Attachment.** Exterior metal veneer shall be securely attached to the supporting masonry or framing members with corrosion-resistant fastenings, metal ties or by other approved devices or methods. The spacing of the fastenings or ties shall not exceed 24 inches (610 mm) either vertically or horizontally, but where units exceed 4 square feet (0.4 m<sup>2</sup>) in area there shall be not less than four attachments per unit. The metal attachments shall have a cross-sectional area not less than provided by W 1.7 wire. Such attachments and their supports shall be capable of resisting a horizontal force in accordance with the wind loads specified in Section 1609, but in no case less than 20 psf (0.958 kg/m<sup>2</sup>).

**1405.11.2 Weather protection.** Metal supports for exterior metal veneer shall be protected by painting, galvanizing or by other approved coating or treatment. Wood studs, furring strips or other wood supports for exterior metal veneer shall be approved pressure-treated wood or protected as required in Section 1403.2. Joints and edges exposed to the weather shall be caulked with approved durable waterproofing material or by other approved means to prevent penetration of moisture.

**1405.11.3 Backup.** Masonry backup shall not be required for metal veneer except as is necessary to meet the fire-resistance requirements of this code.

**1405.11.4 Grounding.** Grounding of metal veneers on buildings shall comply with the requirements of Chapter 27 and the *New York City Electrical Code*.

**1405.12 Thin exterior structural glass veneer.** The area of a single section of thin exterior structural glass veneer shall not exceed 10 square feet (0.93 m<sup>2</sup>) where it is not more than 15 feet (4572 mm) above the level of the sidewalk or grade level directly below, and shall not exceed 6 square feet (0.56 m<sup>2</sup>) where it is more than 15 feet (4572 mm) above that level. In no event shall thin exterior structural glass veneer be installed more than 35 feet (10 668 mm) above the level of the sidewalk or grade level directly below.

**1405.12.1 Length and height.** The length or height of any section of thin exterior structural glass veneer shall not exceed 48 inches (1219 mm).

**1405.12.2 Thickness.** The thickness of thin exterior structural glass veneer shall be not less than 0.344 inch (8.7 mm).

**1405.12.3 Application.** Thin exterior structural glass veneer shall be set only after backing is thoroughly dry and after application of an approved bond coat uniformly over the entire surface of the backing so as to effectively seal the surface. Glass shall be set in place with an approved mastic cement in sufficient quantity so that at least 50 percent of the area of each glass unit is directly bonded to the backing by mastic not less than 1/4 inch (6.4



## EXTERIOR WALLS

mm) thick and not more than  $\frac{5}{8}$  inch (15.9 mm) thick. The bond coat and mastic shall be evaluated for compatibility and shall bond firmly together.

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**1405.12.4 Installation at sidewalk level.** Where thin exterior structural glass veneer extends to a sidewalk surface, each section shall rest in an approved metal molding, and be set at least  $\frac{1}{4}$  inch (6.4 mm) above the highest point of the sidewalk. The space between the molding and the sidewalk shall be thoroughly caulked and made water tight.

**1405.12.4.1 Installation above sidewalk level.** Where thin exterior structural glass veneer is installed above the level of the top of a bulkhead facing, or at a level more than 36 inches (914 mm) above the sidewalk level, the mastic cement binding shall be supplemented with approved nonferrous metal shelf angles located in the horizontal joints in every course. Such shelf angles shall be not less than 0.0478-inch (1.21 mm) thick and not less than 2 inches (51 mm) long and shall be spaced at approved intervals, with not less than two angles for each glass unit. Shelf angles shall be secured to the wall or backing with expansion bolts, toggle bolts or by other approved methods.

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**1405.12.5 Joints.** Unless otherwise specifically approved by the commissioner, abutting edges of thin exterior structural glass veneer shall be ground square. Mitered joints shall not be used except where specifically approved for wide angles. Joints shall be uniformly butted with an approved jointing compound and horizontal joints shall be held to not less than 0.063 inch (1.6 mm) by an approved nonrigid substance or device. Where thin exterior structural glass veneer abuts nonresilient material at sides or top, expansion joints not less than  $\frac{1}{4}$  inch (6.4 mm) wide shall be provided.

**1405.12.6 Mechanical fastenings.** Thin exterior structural glass veneer installed above the level of the heads of show windows and veneer installed more than 12 feet (3658 mm) above sidewalk level shall, in addition to the mastic cement and shelf angles, be held in place by the use of fastenings at each vertical or horizontal edge, or at the four corners of each glass unit. Fastenings shall be secured to the wall or backing with expansion bolts, toggle bolts or by other methods. Fastenings shall be so designed as to hold the glass veneer in a vertical plane independent of the mastic cement. Shelf angles providing both support and fastenings shall be permitted.

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**1405.12.7 Flashing.** Exposed edges of thin exterior structural glass veneer shall be flashed with overlapping corrosion-resistant metal flashing or equivalent and caulked with a waterproof compound in a manner to effectively prevent the entrance of moisture between the glass veneer and the backing.

**1405.13 Exterior windows and doors.** Windows and doors installed in exterior walls shall conform to the testing and performance requirements of Section 1715.5.

**1405.13.1 Installation.** Windows and doors shall be installed in accordance with approved manufacturer's instructions. Fastener size and spacing shall be provided

in such instructions and shall be calculated based on maximum loads and spacing used in the tests.

**1405.13.2 Window sills in R-3 occupancy.** In Occupancy Group R-3, one- and two-family dwellings, where the opening of the sill portion of an operable window is located more than 72 inches (1829 mm) above the finished grade or other surface below, the lowest part of the clear opening of the window shall be at a height not less than 24 inches (610 mm) above the finished floor surface of the room in which the window is located. Glazing between the floor and a height of 24 inches (610 mm) shall be fixed or have openings through which a 4-inch (102 mm) diameter sphere cannot pass.

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**Exception:** Openings that are provided with window guards that comply with ASTM F 2090.

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**1405.13.3 Windows in R-2 occupancy.** Windows in R-2 occupancy shall be subject to any applicable requirements of the New York City Department of Health and Mental Hygiene with regard to window guards.

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**1405.14 Vinyl siding.** Vinyl siding conforming to the requirements of this section and complying with ASTM D 3679 shall be permitted on exterior walls of buildings located in areas where the basic wind speed specified in Chapter 16 does not exceed 100 miles per hour (45 m/s) and the building height is less than or equal to 40 feet (12 192 mm) in Exposure C. Where construction is located in areas where the basic wind speed exceeds 100 miles per hour (45 m/s)±, or building heights are in excess of 40 feet (12 192 mm), tests or calculations indicating compliance with Chapter 16 shall be submitted. Vinyl siding shall be secured to the building so as to provide weather protection for the exterior walls of the building.

**1405.14.1 Application.** The siding shall be applied over sheathing or materials listed in Section 2304.6. Siding shall be applied to conform with the water-resistive barrier requirements in Section 1403. Siding and accessories shall be installed in accordance with approved manufacturer's instructions. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding and accessories shall have a minimum 0.313-inch (7.9 mm) head diameter and  $\frac{1}{8}$ -inch (3.18 mm) shank diameter. The nails shall be corrosion resistant and shall be long enough to penetrate the studs or nailing strip at least  $\frac{3}{4}$  inch (19 mm). Where the siding is installed horizontally, the fastener spacing shall not exceed 16 inches (406 mm) horizontally and 12 inches (305 mm) vertically. Where the siding is installed vertically, the fastener spacing shall not exceed 12 inches (305 mm) horizontally and 12 inches (305 mm) vertically.

**1405.15 Cement plaster.** Cement plaster applied to exterior walls shall conform to the requirements specified in Chapter 25.

**1405.16 Fiber cement siding.** Fiber cement siding complying with Section 1404.10 shall be permitted on exterior walls of Type I, II, III, IV and V construction for wind pressure resistance or wind speed exposures as indicated by the manufacturer's listing and label and approved installation instructions. Where specified, the siding shall be installed

over sheathing or materials listed in Section 2304.6 and shall be installed to conform to the water-resistive barrier requirements in Section 1403. Siding and accessories shall be installed in accordance with approved manufacturer's instructions. Unless otherwise specified in the approved manufacturer's instructions, nails used to fasten the siding to wood studs shall be corrosion-resistant round head smooth shank and shall be long enough to penetrate the studs at least 1 inch (25 mm). For metal framing, all-weather screws shall be used and shall penetrate the metal framing at least three full threads.

**1405.16.1 Panel siding.** Fiber-cement panels shall comply with the requirements of ASTM C 1186, Type A, minimum Grade II. Panels shall be installed with the long dimension either parallel or perpendicular to framing. Vertical and horizontal joints shall occur over framing members and shall be sealed with caulking, covered with battens or shall be designed to comply with Section 1403.2. Panel siding shall be installed with fasteners in accordance with the approved manufacturer's instructions.

**1405.16.2 Lap siding.** Fiber-cement lap siding having a maximum width of 12 inches (305 mm) shall comply with the requirements of ASTM C 1186, Type A, minimum Grade II. Lap siding shall be lapped a minimum of 1<sup>1</sup>/<sub>4</sub> inches (32 mm) and lap siding not having tongue-and-groove end joints shall have the ends sealed with caulking, covered with an H-section joint cover, located over a strip of flashing or shall be designed to comply with Section 1403.2. Lap siding courses shall be installed with the fastener heads exposed or concealed in accordance with the approved manufacturers' instructions.

**1405.17 Fastening.** Weather boarding and wall coverings shall be securely fastened with aluminum, copper, zinc, zinc-coated or other approved corrosion-resistant fasteners in accordance with the nailing schedule in Table 2304.9.1 or the approved manufacturer's installation instructions. Shingles and other weather covering shall be attached with appropriate standard shingle nails to furring strips securely nailed to studs, or with approved mechanically bonding nails, except where sheathing is of wood not less than 1-inch (25 mm) nominal thickness or of wood structural panels as specified in Table 2308.9.3(3).

## SECTION BC 1406 COMBUSTIBLE MATERIALS ON THE EXTERIOR SIDE OF EXTERIOR WALLS

**1406.1 General.** Section 1406 shall apply to exterior wall coverings, exterior balconies and similar projections, bay and oriel windows, decks, porches, porticos, entranceways, and storm enclosures constructed of combustible materials.

**1406.2 Combustible exterior wall coverings.** Combustible exterior wall coverings, including architectural trim, shall comply with this section.

**Exception:** Plastics complying with Chapter 26.

**1406.2.1 Ignition resistance.** Combustible exterior wall coverings shall be tested in accordance with NFPA 268.

**Exceptions:** The following materials are not required to be tested in accordance with NFPA 268. However, such materials shall comply with all other provisions of Section 1406.

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1. Wood or wood-based products.
2. Other combustible materials covered with an exterior covering other than vinyl sidings listed in Table 1405.2.
3. Aluminum having a minimum thickness of 0.019 inch (0.48 mm).
4. Exterior wall coverings on exterior walls of Type V construction.

**1406.2.1.1 Fire separation 5 feet or less.** Where installed on exterior walls having a fire separation distance of 5 feet (1524 mm) or less, combustible exterior wall coverings shall not exhibit sustained flaming as defined in NFPA 268.

**1406.2.1.2 Fire separation greater than 5 feet.** For fire separation distances greater than 5 feet (1524 mm), an assembly shall be permitted that has been exposed to a reduced level of incident radiant heat flux in accordance with the NFPA 268 test method without exhibiting sustained flaming. The minimum fire separation distance required for the assembly shall be determined from Table 1406.2.1.2 based on the maximum tolerable level of incident radiant heat flux that does not cause sustained flaming of the assembly.

TABLE 1406.2.1.2  
MINIMUM FIRE SEPARATION FOR COMBUSTIBLE VENEERS

FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m <sup>2</sup> )	FIRE SEPARATION DISTANCE (feet)	TOLERABLE LEVEL INCIDENT RADIANT HEAT ENERGY (kW/m <sup>2</sup> )
5	12.5	16	5.9
6	11.8	17	5.5
7	11.0	18	5.2
8	10.3	19	4.9
9	9.6	20	4.6
10	8.9	21	4.4
11	8.3	22	4.1
12	7.7	23	3.9
13	7.2	24	3.7
14	6.7	25	3.5
15	6.3		

For SI: 1 foot = 304.8 mm, 1 Btu/H<sup>2</sup> × °F = .0057 kW/m<sup>2</sup> × K.

**1406.2.2 Type I, II, III and IV construction.** In buildings of Type I, II, III and IV construction, exterior wall coverings shall be permitted to be constructed of combustible materials in accordance with Section 1406.2.1 and with the following limitations.

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1. Combustible exterior wall coverings shall not exceed 10 percent of the exterior wall surface area on any given story. Such combustible exterior wall

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## EXTERIOR WALLS

- coverings shall not be permitted on exterior walls where the fire separation distance is 5 feet (1524 mm) or less.‡
2. Combustible wall coverings shall be limited to 40 feet (12 192 mm) in height above grade plane.
3. Combustible exterior wall coverings constructed of fire-retardant-treated wood complying with Section 2303.2 for exterior installation shall not be limited in wall surface area where the fire separation distance is 5 feet (1524 mm) or less and shall be permitted up to 60 feet (18 288 mm) in height above grade plane regardless of the fire separation distance.

**1406.2.3 Location.** Where combustible exterior wall covering is located along the top of exterior walls, such trim shall be completely backed up by the exterior wall and shall not extend over or above the top of exterior walls.

**1406.2.4 Fireblocking.** Where the combustible exterior wall covering is furred from the wall and forms a solid surface, the distance between the back of the covering and the wall shall not exceed 1<sup>5</sup>/<sub>8</sub> inches (41 mm). ‡Where required by Section 717, the space thereby created shall be fireblocked.

➔ **1406.3 Exterior balconies and similar projections.** Exterior balconies and similar projections shall be permitted to be constructed of combustible materials provided that the exterior balcony or similar projection affords the fire-resistance rating required by Table 601 for floor construction.

### Exceptions:

1. Balconies or similar projections serving as a required exit shall not be constructed of combustible materials.
2. Balconies or similar projections on the exterior of buildings of Type I or II construction shall not be constructed of combustible materials.

⇒ **1406.4 Bay and oriel windows, decks, porches, porticos, entranceways, and storm enclosures.** Bay and oriel windows, decks, porches, porticos, entranceways and storm enclosures shall conform to the type of construction required for the building to which they are attached, including required fire rating, unless otherwise modified by the requirements of this section. For the purposes of this section, such structures shall be referred to as, "appendages."

**Exception:** Plastic complying with Chapter 26.

**1406.4.1 Appendages on Type I and II construction.** Appendages on buildings of Type I or II construction shall be constructed of noncombustible materials. However, on buildings not more than three stories or 40 feet (12 192 mm) in height, whichever is less, fire-retardant-treated wood shall be permitted.

**1406.4.2 Appendages on Type III, IV and VA construction.** Appendages on buildings of Type III, IV and VA construction may be constructed of combustible materials, provided that all the following conditions are met:

1. Such building does not exceed 3 stories or 40 feet (12 192 mm) in height, whichever is less.

2. The main use or dominant occupancy of such building is classified in Occupancy Group R-2 or R-3.
3. The appendage has an exterior separation on all exposed sides of at least 15 feet (4572 mm), measured from the outermost surface of the appendage, except that appendages with exposed sides protected by minimum 1-hour fire-rated construction extending at least 36 inches (914 mm) above the highest combustible horizontal surface may be located up to a minimum distance of 36 inches (914 mm) from any property line.
4. The appendage is so constructed that its removal or destruction will not reduce the structural stability or fire-resistive integrity of the building.
5. The appendage has a superficial area not exceeding 150 square feet (13.9 m<sup>2</sup>) when viewed from directly above and is included in the area limitations of Table 503 for the entire building.
6. The appendage is not higher than the sills of the second-story windows.
7. The vertical surface area of the combustible portions of the appendage does not exceed 10 percent of the total wall area (windows excluded) of the building.
8. For enclosed appendages, the roof of the appendage has a class A roof covering, and the soffit or ceiling covering the combustible roof framing shall have a minimum 1-hour fire-resistance rating.

**Exception:** Appendages constructed of fire-retardant-treated wood, on buildings not exceeding 3 stories or 40 feet (12 192 mm) in height, whichever is less, need not comply with Items 2 through 8.

**1406.4.3 Appendages on Type VB construction.** Appendages may be constructed of combustible materials on buildings of construction Type VB.

## SECTION BC 1407 METAL COMPOSITE MATERIALS (MCM)

**1407.1 General.** The provisions of this section shall govern the materials, construction and quality of metal composite materials (MCM) for use as exterior wall coverings in addition to other applicable requirements of Chapters 14 and 16.

**1407.1.1 Plastic core.** The plastic core of the MCM shall not contain foam plastic insulation as defined in Section 2602.1.

**1407.2 Exterior wall finish.** MCM used as exterior wall finish or as elements of balconies and similar appendages and bay and oriel windows to provide cladding or weather resistance shall comply with Sections 1407.4 through 1407.14.

**1407.3 Architectural trim and embellishments.** MCM used as architectural trim or embellishments shall comply with Sections 1407.7 through 1407.14.

**1407.4 Structural design.** MCM systems shall be designed and constructed to resist wind loads as required by Chapter 16 for components and cladding.



**1407.5 Approval.** Results of approved tests or an engineering analysis shall be submitted to the commissioner to verify compliance with the requirements of Chapter 16 for wind loads.

**1407.6 Weather resistance.** MCM systems shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's installation instructions.

**1407.7 Durability.** MCM systems shall be constructed of approved materials that maintain the performance characteristics required in Section 1407 for the duration of use.

**1407.8 Fire-resistance rating.** Where MCM systems are used on exterior walls required to have a fire-resistance rating in accordance with Section 705, evidence shall be submitted to the commissioner that the required fire-resistance rating is maintained.

**Exception:** MCM systems not containing foam plastic insulation, which are installed on the outer surface of a fire-resistance-rated exterior wall in a manner such that the attachments do not penetrate through the entire exterior wall assembly, shall not be required to comply with this section.

**1407.9 Surface-burning characteristics.** Unless otherwise specified, MCM shall have a flame spread index of 75 or less and a smoke-developed index of 450 or less when tested in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723.

**1407.10 Type I, II, III and IV construction.** Where installed on buildings of Type I, II, III and IV construction, MCM systems shall comply with Sections 1407.10.1 through 1407.10.3, or Section 1407.11.

**1407.10.1 Surface-burning characteristics.** MCM shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested as an assembly in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723.

**1407.10.2 Thermal barriers.** MCM shall be separated from the interior of a building by an approved thermal barrier consisting of  $\frac{1}{2}$ -inch (12.7 mm) gypsum wall-board or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (121°C) after 15 minutes of fire exposure in accordance with the standard time-temperature curve of ASTM E 119 or UL 263. The thermal barrier shall be installed in such a manner that it will remain in place for not less than 15 minutes based on a test conducted in accordance with UL 1715.

#### Exceptions:

1. The thermal barrier is not required where the MCM system is specifically approved based on tests conducted in accordance with UL 1040 or UL 1715. Such testing shall be performed with the MCM in the maximum thickness intended for use. The MCM system shall include seams, joints and other typical details used in the installation and shall be tested in the manner intended for use.

2. The thermal barrier is not required where the MCM is used as elements of balconies and similar appendages, architectural trim or embellishments.

**1407.10.3 Full-scale tests.** The MCM system shall be tested in accordance with, and comply with, the acceptance criteria of NFPA 285. Such testing shall be performed on the MCM system with the MCM in the maximum thickness intended for use.

**1407.11 Alternate conditions.** MCM and MCM systems shall not be required to comply with Sections 1407.10.1 through 1407.10.3 provided such systems comply with Section 1407.11.1 or 1407.11.2.

**1407.11.1 Installations up to 40 feet in height.** MCM shall be permitted to be installed no more than 40 feet (12 190 mm) in height above grade provided the MCM is installed in accordance with Sections 1407.11.1.1 and 1407.11.1.2.

**1407.11.1.1 Fire separation distance of 5 feet or less.** Where the fire separation distance is 5 feet (1524 mm) or less, the area of MCM shall not exceed 10 percent of the exterior wall surface.

**1407.11.1.2 Fire separation distance greater than 5 feet.** Where the fire separation distance is greater than 5 feet (1524 mm), there shall be no limit on the area of exterior wall surface coverage using MCM.

**1407.11.2 Installations up to 50 feet in height.** MCM shall be permitted to be installed no more than 50 feet (15 240 mm) in height above grade provided the MCM meets the requirements of Sections 1407.11.2.1 and 1407.11.2.2.

**1407.11.2.1 Self ignition temperature.** MCM shall have a self-ignition temperature of 650°F (343°C) or greater when tested in accordance with ASTM D 1929.

**1407.11.2.2 Limitations.** Sections of MCM shall not exceed 300 square feet (27.9 m<sup>2</sup>) in area and shall be separated by a minimum of 4 feet (1219 mm) vertically.

**1407.12 Type V construction.** MCM shall be permitted to be installed on buildings of Type V construction.

**1407.13 Foam plastic insulation.** MCM systems containing foam plastic insulation shall also comply with the requirements of Section 2603.

**1407.14 Labeling.** MCM shall be labeled in accordance with Chapter 17.

## SECTION BC 1408 EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)

**1408.1 General.** The provisions of this section shall govern the materials, construction and quality of exterior insulation and finish systems (EIFS) for use as exterior wall coverings in addition to other applicable requirements of Chapters 7, 14, 16, 17 and 26.



## EXTERIOR WALLS

**1408.2 Performance characteristics.** EIFS shall be constructed such that it meets the performance characteristics required in ASTM E 2568.

**1408.3 Structural design.** The underlying structural framing and substrate shall be designed and constructed to resist loads as required by Chapter 16.

**1408.4 Weather resistance.** EIFS shall comply with Section 1403 and shall be designed and constructed to resist wind and rain in accordance with this section and the manufacturer's application instructions.

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**1408.4.1 EIFS with drainage.** EIFS with drainage shall have an average minimum drainage efficiency of 90 percent when tested in accordance with requirements of ASTM E 2273 and is required on framed walls of Type V construction, residential Group R occupancies.

**1408.4.1.1 Water-resistive barrier.** For EIFS with drainage, the water-resistive barrier shall comply with Section 1404.2 or ASTM E 2570.

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**1408.5 Installation.** Installation of the EIFS and EIFS with drainage shall be in accordance with the EIFS manufacturer's instructions and this section.

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**1408.6 Special inspections.** EIFS installations shall comply with the provisions of Chapter 17.

## CHAPTER 15

# ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

### SECTION BC 1501 GENERAL

**1501.1 Scope.** The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

### SECTION BC 1502 DEFINITIONS

**1502.1 General.** The following terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**AGGREGATE.** In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for roof coverings.

**BALLAST.** In roofing, ballast comes in the form of large stones or paver systems or light-weight interlocking paver systems and is used to provide uplift resistance to components of the roof assembly systems that are not adhered or mechanically attached to the roof deck.

**BUILT-UP ROOF COVERING.** Two or more layers of felt cemented together and surfaced with a cap sheet, mineral aggregate, smooth coating or similar surfacing material.

**BULKHEAD.** An enclosed rooftop structure enclosing a shaft, stairway, tank or service equipment, or other space not designed or used for human occupancy.

**CONTAINER GARDEN.** A plant or plants maintained in a pot or planters that is at least 6 inches (152 mm) high and located on a roof, terrace, or other horizontal exterior area.

**GREEN ROOF SYSTEM.** A system constructed in-situ consisting of either a roof assembly and additional landscape material components, including growing media, engineered soils, filter fabric, integral drainage systems and roof surface to facilitate the growth of vegetation or a pre-vegetated tray or trays no more than 6 inches (152 mm) high and assembled on top of a roof covering.

**INTERLAYMENT.** A layer of felt or nonbituminous saturated felt not less than 18 inches (457 mm) wide, shingled between each course of a wood-shake roof covering.

**MECHANICAL EQUIPMENT SCREEN.** A partially enclosed rooftop structure used to aesthetically conceal heating, ventilating and air conditioning (HVAC) electrical or mechanical equipment from view.

**METAL ROOF PANEL.** An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (.279 m<sup>2</sup>) per sheet.

**METAL ROOF SHINGLE.** An interlocking metal sheet having an installed weather exposure less than 3 square feet (.279 m<sup>2</sup>) per sheet.

**MODIFIED BITUMEN ROOF COVERING.** One or more layers of polymer-modified asphalt sheets. The sheet materi-

als shall be fully adhered or mechanically attached to the substrate or held in place with an approved ballast layer.

**PENTHOUSE.** An enclosed rooftop structure which is designed or used for human occupancy. NYC  
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**POSITIVE ROOF DRAINAGE.** The drainage condition in which consideration has been made for all loading deflections of the roof deck, including ponding instability, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation. NYC

**REROOFING.** The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement."

**ROOF ASSEMBLY.** A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof deck, substrate or thermal barrier, insulation, vapor retarder and roof covering. This definition of "Roof assembly" is limited in application to the provisions of Chapter 15. NYC

**ROOF COVERING.** The covering applied to the roof deck for weather resistance, fire classification or appearance.

**ROOF COVERING SYSTEM.** See "Roof assembly."

**ROOF DECK.** The flat or sloped surface not including its supporting members or vertical supports.

**ROOF RECOVER.** The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

**ROOF REPLACEMENT.** The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering. ⇐

**ROOF VENTILATION.** The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, attics, cathedral ceilings or other enclosed spaces over which a roof assembly is installed.

**ROOFTOP STRUCTURE.** An enclosed or unenclosed structure on or above the roof of any part of a building. NYC

**SINGLE-PLY MEMBRANE.** A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers. ⇐

**UNDERLAYMENT.** One or more layers of felt, sheathing paper, nonbituminous saturated felt or other approved material over which a steep-slope roof covering is applied.

### SECTION BC 1503 WEATHER PROTECTION

**1503.1 General.** Roof decks shall be covered with approved roof coverings secured to the building or structure in accordance with the provisions of this chapter. Roof coverings

shall be designed and installed in accordance with this code and the approved manufacturer's instructions such that the roof covering shall serve to protect the building or structure.

**1503.2 Flashing.** Flashing shall be installed in such a manner so as to prevent moisture entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with parapet walls and other penetrations through the roof plane.

**1503.2.1 Locations.** Flashing shall be installed at wall and roof intersections, at gutters, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than 0.019 inch (.483 mm) (No. 26 galvanized sheet).

**1503.3 Coping.** Parapet walls shall be properly coped with noncombustible, weatherproof materials of a width no less than the thickness of the parapet wall.

**1503.4 Roof drainage.** Design and installation of roof drainage systems shall comply with this section and the *New York City Plumbing Code*.

**1503.4.1 Secondary drainage required.** Secondary (emergency overflow) roof drains or scuppers shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped if the primary drains allow buildup for any reason.

**1503.4.2 Scuppers.** When scuppers are used for secondary (emergency overflow) roof drainage, the quantity, size, location and inlet elevation of the scuppers shall be sized to prevent the depth of ponding water from exceeding that for which the roof was designed as determined by Section 1503.4.1. Scuppers shall not have an opening dimension of less than 4 inches (102 mm). The flow through the primary system shall not be considered when locating and sizing scuppers.

**1503.4.3 Gutters.** Gutters and leaders placed on the outside of buildings shall be of noncombustible, corrosion-resistant material, or a minimum of Schedule 40 plastic pipe.

**1503.4.3.1 Height limitations.** Vertical sections of exterior leaders made from galvanized steel, galvanized wrought iron, cast iron, brass, or similar heavy material shall be permitted only for the first 15 feet (4572 mm) of leader extending up from grade, provided that the leader is securely anchored with offset clamps to the face of the building at no fewer than two points along the vertical section of the leader. Horizontal sections of exterior gutter made from such heavy materials shall not be permitted higher than 15 feet (4572 mm) above grade.

**1503.5 Roof ventilation.** Intake and exhaust vents shall be provided in accordance with Section 1203.2 and the manufacturer's installation instructions.

**1503.6 Crickets and saddles.** A cricket or saddle shall be installed on the ridge side of any chimney or penetration greater than 30 inches (762 mm) wide as measured perpendicular to the slope. Cricket or saddle coverings shall be sheet metal or of the same material as the roof covering.

## SECTION BC 1504 PERFORMANCE REQUIREMENTS

**1504.1 Wind resistance of roofs.** Roof decks and roof coverings shall be designed for wind loads in accordance with Chapter 16 and Sections 1504.2, 1504.3 and 1504.4.

**1504.1.1 Wind resistance of asphalt shingles.** Asphalt shingles shall comply with Section 1507.2. NYC

**1504.2 Wind resistance of clay and concrete tile.** Wind loads on clay and concrete tile roof coverings shall be in accordance with Section 1609. NYC

**1504.3 Wind resistance of nonballasted roofs.** Roof coverings installed on roofs in accordance with Section 1507 that are mechanically attached or adhered to the roof deck shall be designed to resist the design wind load pressures for components and cladding in accordance with Section 1609.

**1504.3.1 Other roof systems.** Roof systems with built-up, modified bitumen, fully adhered or mechanically attached single-ply through fastened metal panel roof systems, and other types of membrane roof coverings shall also be tested in accordance with FM 4474, UL 580 or UL 1897.

**1504.3.2 Metal panel roof systems.** Metal panel roof systems through fastened or standing seam shall be tested in accordance with UL 580 or ASTM E 1592.

**Exception:** Metal roofs constructed of cold-formed steel, where the roof deck acts as the roof covering and provides both weather protection and support for structural loads, shall be permitted to be designed and tested in accordance with the applicable referenced structural design standard in Section 2209.1.

**1504.4 Ballasted low-slope roof systems.** Ballasted low-slope (roof slope < 2:12) single-ply roof system coverings installed in accordance with Sections 1507.12 and 1507.13 shall be designed in accordance with Section 1504.8 and ANSI/SPRI RP-4.

**1504.5 Edge securement for low-slope roofs.** Low-slope membrane roof systems metal edge securement, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined in accordance with Chapter 16. NYC

**1504.6 Physical properties.** Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G 152, ASTM G 155 or ASTM G 154. Those roof coverings that are subject to cyclical flexural response due to wind loads shall not demonstrate any significant loss of tensile strength for unreinforced membranes or breaking strength for reinforced membranes when tested as herein required. NYC

**1504.7 Impact resistance.** Roof coverings installed on low-slope roofs (roof slope < 2:12) in accordance with Section 1507 shall resist impact damage based on the results of tests conducted in accordance with ASTM D 3746, ASTM D 4272, CGSB 37-GP-52M or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470.

**1504.8 Aggregate.** Aggregate used as surfacing for roof coverings and aggregate, gravel or stone used as ballast shall not be used on the roof of a building located in a hurricane-prone region as defined in Section 1609.2, or on any other building with a mean roof height exceeding that permitted by Table 1504.8 based on the exposure category and basic wind speed at the site.

**TABLE 1504.8**  
**MAXIMUM ALLOWABLE MEAN ROOF HEIGHT PERMITTED**  
**FOR BUILDINGS WITH AGGREGATE ON THE ROOF IN**  
**AREAS OUTSIDE A HURRICANE-PRONE REGION<sup>d</sup>**

BASIC WIND SPEED FROM SECTION 1609.3 (mph) <sup>b</sup>	MAXIMUM MEAN ROOF HEIGHT (ft) <sup>a, c</sup>		
	Exposure category		
	B	C	D
85	170	60	30
90	110	35	15
95	75	20	NP
100	55	15	NP
105	40	NP	NP
110	30	NP	NP
115	20	NP	NP
120	15	NP	NP
Greater than 120	NP	NP	NP

For SI: 1 foot = 304.8 mm; 1 mile per hour = 0.447 m/s.

- Mean roof height as defined in ASCE 7.
- For intermediate values of basic wind speed, the height associated with the next higher value of wind speed shall be used, or direct interpolation is permitted.
- NP = gravel and stone not permitted for any roof height.
- New York City is in a Hurricane-Prone Region pursuant to Section 1609.2.

**1504.9 Reflectance.** Roof coverings on roofs or setbacks with slope equal to or less than two units vertical in 12 units horizontal (17 percent) shall have:

- A minimum initial solar reflectance of 0.7 in accordance with ASTM C 1549 or ASTM E 1918, and a minimum thermal emittance of 0.75 as determined in accordance with ASTM C 1371 or ASTM E 408; or
- A minimum SRI of 78 as determined in accordance with ASTM E 1980.

**Exceptions:**

- Terraces on setbacks comprising less than 25 percent of the area of the largest floor plate in the building.
- Any portion of a roof covered by a green roof system, including such a system with agricultural plantings, in compliance with Section 1507.16.
- Any portion of a roof used as outdoor recreation space by the occupants of the building that is landscaped, covered by wood decking or covered with a walking surface or other protective surface, provided that such walking surface or protective surface has a minimum initial solar reflectance of 0.3 as determined in accordance with ASTM C 1549 or ASTM E 1918.

- Ballasted roofs, provided that the ballast has a minimum initial solar reflectance of 0.2 as determined in accordance with ASTM C 1549 or ASTM E 1918.
- Any portion of a roof that is under mechanical equipment, flush mounted solar panels lying directly on the roof surface, duckboarding, decking, platform, roof tank, cooling tower or any other rooftop structure or equipment exempted by rule by the commissioner.
- Any roof or portion of a roof composed of glass, metal, clay or concrete tile or plastic/rubber intended to simulate clay or concrete tile, wood, or slate.
- Any portion of a roof used by a school or daycare center as a playground for children.
- Any roof, if the amount of rooftop space not subject to exceptions 1 through 7 is in the aggregate less than 100 square feet (9.3 m<sup>2</sup>).

**SECTION BC 1505**  
**FIRE CLASSIFICATION**

**1505.1 General.** Roof assemblies shall be divided into the classes defined below. Class A, B and C roof assemblies and roof coverings required to be listed by this section shall be tested in accordance with ASTM E 108 or UL 790. In addition, fire-retardant-treated wood roof coverings shall be tested in accordance with ASTM D 2898. The minimum roof coverings installed on buildings shall comply with Table 1505.1 based on the type of construction of the building.

**Exception:** Skylights and sloped glazing that comply with Chapter 24 or Section 2610.

**TABLE 1505.1<sup>a,b</sup>**  
**MINIMUM ROOF COVERING CLASSIFICATION**  
**FOR TYPES OF CONSTRUCTION**

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	B	B	B	B	B	C <sup>b</sup>

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

- Unless otherwise required due to the location of the building within a fire district in accordance with Section D102.2.3 in Appendix D.
- Buildings that are not more than two stories above grade plane and having not more than 6,000 square feet of projected roof area and where there is a minimum 10-foot fire-separation distance from the leading edge of the roof to a lot line on all sides of the building, except for street fronts or public ways, shall be permitted to have roofs of No. 1 cedar or redwood shakes and No. 1 shingles in accordance with Section 1505.6.

**1505.2 Class A roof assemblies.** Class A roof assemblies are those that are effective against severe fire test exposure. Class A roof assemblies and roof coverings shall be listed and identified as Class A by an approved testing agency. Class A roof assemblies shall be permitted for use in buildings or structures of all types of construction.

**Exceptions:**

- Class A roof assemblies include those with coverings of brick, masonry, or an exposed concrete roof deck.
- Class A roof assemblies also include ferrous or copper shingles or sheets, metal sheets and shingles,



clay or concrete roof tile or slate installed on non-combustible decks or ferrous, copper or metal sheets installed without a roof deck on noncombustible framing.

**1505.3 Class B roof assemblies.** Class B roof assemblies are those that are effective against moderate fire-test exposure. Class B roof assemblies and roof coverings shall be listed and identified as Class B by an approved testing agency.

**1505.4 Class C roof assemblies.** Class C roof assemblies are those that are effective against light fire-test exposure. Class C roof assemblies and roof coverings shall be listed and identified as Class C by an approved testing agency.

**1505.5 Construction of sloping roofs.** Roofs having a slope of more than 60 degrees (1.05 rad) to the horizontal shall be constructed of material having the same fire-resistance rating as required for an exterior nonbearing wall of the building of which it is a part. When the slope is 60 degrees (1.05 rad) or less to the horizontal, the sloping roof shall be constructed as required for the roof of the building. Where the back of a false mansard is exposed to the outdoors, the back shall be covered with noncombustible material or with roof covering as required for the roof of the building.

**1505.6 Fire-retardant-treated wood shingles and shakes.** Fire-retardant-treated wood shakes and shingles shall be treated by impregnation with chemicals by the full-cell vacuum-pressure process, in accordance with AWPAC1. Each bundle shall be marked to identify the manufactured unit and the manufacturer, and shall also be labeled to identify the classification of the material in accordance with the testing required in Section 1505.1, the treating company and the quality control agency.

**1505.7 Special purpose roofs.** Special purpose wood shingle or wood shake roofing shall conform with the grading and application requirements of Section 1507.8 or Section 1507.9. In addition, an underlayment of  $\frac{3}{8}$  inch (15.9 mm) Type X water-resistant gypsum backing board or gypsum sheathing shall be placed under minimum nominal  $\frac{1}{2}$ -inch-thick (12.7 mm) wood structural panel solid sheathing or 1-inch (25 mm) nominal spaced sheathing.

**1505.8 Photovoltaic systems.** Rooftop installed photovoltaic systems that are adhered or attached to the roof covering or photovoltaic modules/shingles installed as roof coverings shall be labeled to identify their fire classification in accordance with the testing required in Section 1505.1.

## SECTION BC 1506 MATERIALS

**1506.1 Scope.** The requirements set forth in this section shall apply to the application of roof-covering materials specified herein. Roof coverings shall be applied in accordance with this chapter and the manufacturer's installation instructions. Installation of roof coverings shall comply with the applicable provisions of Section 1507.

**1506.2 Compatibility of materials.** Roofs and roof coverings shall be of materials that are compatible with each other and with the building or structure to which the materials are applied.

**1506.3 Material specifications and physical characteristics.** Roof-covering materials shall conform to the applicable standards listed in this chapter. In the absence of applicable standards or where materials are of questionable suitability, testing by an approved agency shall be required by the commissioner to determine the character, quality and limitations of application of the materials.

**1506.4 Product identification.** Roof-covering materials shall be delivered in packages bearing the manufacturer's identifying marks and approved testing agency labels required in accordance with Section 1505. Bulk shipments of materials shall be accompanied with the same information issued in the form of a certificate or on a bill of lading by the manufacturer.

## SECTION BC 1507 REQUIREMENTS FOR ROOF COVERINGS

**1507.1 Scope.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

**1507.2 Asphalt shingles.** The installation of asphalt shingles shall comply with the provisions of this section.

**1507.2.1 Deck requirements.** Asphalt shingles shall be fastened to solidly sheathed decks.

**1507.2.2 Slope.** Asphalt shingles shall only be used on roof slopes of two units vertical in 12 units horizontal (17-percent slope) or greater. For roof slopes from two units vertical in 12 units horizontal (17-percent slope) up to four units vertical in 12 units horizontal (33-percent slope), double underlayment application is required in accordance with Section 1507.2.8.

**1507.2.3 Underlayment.** Unless otherwise noted, required underlayment shall conform to ASTM D 226, Type I, ASTM D 4869, Type I, or ASTM D 6757.

**1507.2.4 Self-adhering polymer modified bitumen sheet.** Self-adhering polymer modified bitumen sheet shall comply with ASTM D 1970.

**1507.2.5 Asphalt shingles.** Asphalt shingles shall comply with ASTM D 225 or ASTM D 3462.

**1507.2.6 Fasteners.** Fasteners for asphalt shingles shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12 gage (0.105 inches (2.67 mm)) shank with a minimum  $\frac{3}{8}$  inch-diameter (9.5 mm) head, of a length to penetrate through the roofing materials and a minimum of  $\frac{3}{4}$  inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than  $\frac{3}{4}$  inch (19.1 mm) thick, the nails shall penetrate through the sheathing. Fasteners shall comply with ASTM F 1667.

**1507.2.7 Attachment.** Asphalt shingles shall have the minimum number of fasteners required by the manufacturer, but not less than four fasteners per strip shingle or two fasteners per individual shingle. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.

**1507.2.7.1 Wind resistance.** Asphalt shingles shall be tested in accordance with ASTM D 7158. Asphalt shingles shall be tested in accordance with ASTM D 7158. Asphalt shingles shall be tested in accordance with ASTM D 7158.

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gles shall meet the classification requirements of Table 1507.2.7.1(1) for the maximum basic wind speed per Section 1609. Asphalt shingle packaging shall bear a label to indicate compliance with ASTM D 7158 and the required classification in Table 1507.2.7.1(1).

**Exception:** Asphalt shingles not included in the scope of ASTM D 7158 shall be tested and labeled to indicate compliance with ASTM D 3161 and the required classification in Table 1507.2.7.1(2).

**TABLE 1507.2.7.1(1)**  
**CLASSIFICATION OF ASPHALT ROOF PER ASTM D 7158<sup>a</sup>**

MAXIMUM BASIC WIND SPEED FROM SECTION 1609	CLASSIFICATION REQUIREMENT
85	D, G, or H
90	D, G, or H
100	G or H
110	G or H
120	G or H
130	H
140	H
150	H

a. The standard calculations contained in ASTM D 7158 assume exposure category B or C and building height of 60 feet (18 288 mm) or less. Additional calculations are required for conditions outside of these assumptions.

**TABLE 1507.2.7.1(2)**  
**CLASSIFICATION OF ASPHALT SHINGLES PER ASTM D 3161**

MAXIMUM BASIC WIND SPEED FROM SECTION 1609	CLASSIFICATION REQUIREMENT
85	A, D or F
90	A, D or F
100	A, D or F
110	F
120	F
130	F
140	F
150	F

**1507.2.8 Underlayment application.** For roof slopes from two units vertical in 12 units horizontal (17-percent slope), up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be two layers applied in the following manner. Apply a minimum 19-inch-wide (483 mm) strip of underlayment felt parallel with and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply 36-inch-wide (914 mm) sheets of underlayment overlapping successive sheets 19 inches (483 mm) and fastened sufficiently to hold in place. Distortions in the underlayment shall not interfere with the

ability of the shingles to seal. For roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater, underlayment shall be one layer applied in the following manner. Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped 2 inches (51 mm), fastened only as necessary to hold in place. Distortions in the underlayment shall not interfere with the ability of the shingles to seal.

**1507.2.8.1 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.2.9 Flashings.** Flashing for asphalt shingles shall comply with this section. Flashing shall be applied in accordance with this section and the asphalt shingle manufacturer's printed instructions.

**1507.2.9.1 Base and cap flashing.** Base and cap flashing shall be installed in accordance with the manufacturer's instructions. Base flashing shall be of either corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness or mineral-surfaced roll roofing weighing a minimum of 77 pounds per 100 square feet (3.76 kg/m<sup>2</sup>). Cap flashing shall be corrosion-resistant metal of minimum nominal 0.019-inch (0.483 mm) thickness.

**1507.2.9.2 Valleys.** Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles. Valley linings of the following types shall be permitted:

1. For open valleys (valley lining exposed) lined with metal, the valley lining shall be at least 24 inches (610 mm) wide and of any of the corrosion-resistant metals in Table 1507.2.9.2.
2. For open valleys, valley lining of two plies of mineral-surfaced roll roofing complying with ASTM D 3909 or ASTM D 6380 shall be permitted. The bottom layer shall be 18 inches (457 mm) and the top layer a minimum of 36 inches (914 mm) wide.
3. For closed valleys (valleys covered with shingles), valley lining of one ply of smooth roll roofing complying with ASTM D 6380 and at least 36 inches (914 mm) wide or types as described in Item 1 or 2 above shall be permitted. Self-adhering polymer modified bitumen underlayment complying with ASTM D 1970 shall be permitted in lieu of the lining material.

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**TABLE 1507.2.9.2  
VALLEY LINING MATERIAL**

MATERIAL	MINIMUM THICKNESS	GAGE	WEIGHT
Aluminum	0.024 in.	—	—
Cold-rolled copper	0.0216 in.	—	ASTM B 370, 16 oz. per sq. ft.
Copper	—	—	16 oz.
Galvanized steel	0.0179 in.	26 (zinc-coated G90)	—
High-yield copper	0.0162 in.	—	ASTM B 370, 12 oz. per sq. ft.
Lead	—	—	2.5 pounds
Lead-coated copper	0.0216 in.	—	ASTM B 101, 16 oz. per sq. ft.
Lead-coated high-yield copper	0.0162	—	ASTM B 101, 12 oz. per sq. ft.
Painted terne	—	—	20 pounds
Stainless steel	—	28	—
Zinc alloy	0.027 in.	—	—

For SI: 1 inch = 25.4 mm, 1 pound = 0.454 kg, 1 ounce = 28.35 g.

**1507.2.9.3 Drip edge.** Provide drip edge at eaves and gables of shingle roofs. Overlap to be a minimum of 2 inches (51 mm). Eave drip edges shall extend  $\frac{1}{4}$  inch (6.4 mm) below sheathing and extend back on the roof a minimum of 2 inches (51 mm). Drip edge shall be mechanically fastened a maximum of 12 inches (305 mm) o.c.

**1507.3 Clay and concrete tile.** The installation of clay and concrete tile shall comply with the provisions of this section.

**1507.3.1 Deck requirements.** Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

**1507.3.2 Deck slope.** Clay and concrete roof tile shall be installed on roof slopes of  $2\frac{1}{2}$  units vertical in 12 units horizontal (21-percent slope) or greater. For roof slopes from  $2\frac{1}{2}$  units vertical in 12 units horizontal (21-percent slope) to four units vertical in 12 units horizontal (33-percent slope), double underlayment application is required in accordance with Section 1507.3.3.

**1507.3.3 Underlayment.** Unless otherwise noted, required underlayment shall conform to: ASTM D 226, Type II; ASTM D 2626 or ASTM D 6380, Class M mineral-surfaced roll roofing.

**1507.3.3.1 Low-slope roofs.** For roof slopes from  $2\frac{1}{2}$  units vertical in 12 units horizontal (21-percent slope), up to four units vertical in 12 units horizontal (33-percent slope), underlayment shall be a minimum of two layers applied as follows:

1. Starting at the eave, a 19-inch (483 mm) strip of underlayment shall be applied parallel with the eave and fastened sufficiently in place.

2. Starting at the eave, 36-inch-wide (914 mm) strips of underlayment felt shall be applied overlapping successive sheets 19 inches (483 mm) and fastened sufficiently in place.

**1507.3.3.2 High-slope roofs.** For roof slopes of four units vertical in 12 units horizontal (33-percent slope) or greater, underlayment shall be a minimum of one layer of underlayment felt applied shingle fashion, parallel to, and starting from the eaves and lapped 2 inches (51 mm), fastened only as necessary to hold in place.

**1507.3.4 Clay tile.** Clay roof tile shall comply with ASTM C 1167.

**1507.3.5 Concrete tile.** Concrete roof tile shall comply with ASTM C 1492.

**1507.3.6 Fasteners.** Tile fasteners shall be corrosion resistant and not less than 11 gage,  $\frac{5}{16}$ -inch (8.0 mm) head, and of sufficient length to penetrate the deck a minimum of  $\frac{3}{4}$  inch (19.1 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2.1 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

**1507.3.7 Attachment.** Clay and concrete roof tiles shall be fastened in accordance with Table 1507.3.7.

**1507.3.8 Application.** Tile shall be applied according to the manufacturer's installation instructions, based on the following:

1. Climatic conditions.
2. Roof slope.
3. Underlayment system.
4. Type of tile being installed.

**1507.3.9 Flashing.** At the juncture of the roof vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley, or a self-adhering polymer-modified bitumen sheet complying with ASTM D 1970, in addition to other required underlayment. For slopes under seven units vertical in 12 units horizontal (58-percent slope), the metal valley flashing† underlayment shall be solid cemented to the roofing underlayment or a self-adhering polymer modified bitumen sheet‡ shall be installed.

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**TABLE 1507.3.7**  
**CLAY AND CONCRETE TILE ATTACHMENT<sup>a, b, c</sup>**

GENERAL — CLAY OR CONCRETE ROOF TILE				
Maximum basic wind speed (mph)	Mean roof height (feet)	Roof slope up to < 3:12	Roof slope 3:12 and over	
85	0–60	One fastener per tile. Flat tile without vertical laps, two fasteners per tile.	Two fasteners per tile. Only one fastener on slopes of 7:12 and less for tiles with installed weight exceeding 7.5 lbs./sq. ft. having a width no greater than 16 inches.	
100	0–40			
100	> 40–60	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic.		
110	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
120	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
130	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
All	> 60	The fastening system shall resist the wind forces in Section 1609.7.3.		
INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS <sup>d, e</sup> (Installations on spaced/solid sheathing with battens or spaced sheathing)				
Maximum basic wind speed (mph)	Mean roof height (feet)	Roof slope up to < 5:12	Roof slope 5:12 < 12:12	Roof slope 12:12 and over
85	0–60	Fasteners are not required. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile.	One fastener per tile every other row. All perimeter tiles require one fastener. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile.	One fastener required for every tile. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile.
100	0–40			
100	> 40–60	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofers's mastic.		
110	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
120	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
130	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
All	> 60	The fastening system shall resist the wind forces in Section 1609.7.3.		
INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS (Installations on solid sheathing without battens)				
Maximum basic wind speed (mph)	Mean roof height (feet)	All roof slopes		
85	0–60	One fastener per tile.		
100	0–40	One fastener per tile.		
100	> 40–60	The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofers's mastic.		
110	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
120	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
130	0–60	The fastening system shall resist the wind forces in Section 1609.7.3.		
All	> 60	The fastening system shall resist the wind forces in Section 1609.7.3.		

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 4.882 kg/m<sup>2</sup>.

- Minimum fastener size. Corrosion-resistant nails not less than No. 11 gage with  $\frac{5}{16}$ -inch head. Fasteners shall be long enough to penetrate into the sheathing  $\frac{3}{4}$  inch or through the thickness of the sheathing, whichever is less. Attaching wire for clay and concrete tile shall not be smaller than 0.083 inch.
- Snow areas. A minimum of two fasteners per tile are required or battens and one fastener.
- Roof slopes greater than 24:12. The nose of all tiles shall be securely fastened.
- Horizontal battens. Battens shall be not less than 1 inch by 2 inch nominal. Provisions shall be made for drainage by a minimum of  $\frac{1}{8}$ -inch riser at each nail or by 4-foot-long battens with at least a  $\frac{1}{2}$ -inch separation between battens. Horizontal battens are required for slopes over 7:12.
- Perimeter fastening areas include three tile courses but not less than 36 inches from either side of hips or ridges and edges of eaves and gable rakes.



**1507.4 Metal roof panels.** The installation of metal roof panels shall comply with the provisions of this section.

**1507.4.1 Deck requirements.** Metal roof panel roof coverings shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced supports.

**NYC 1507.4.2 Deck slope.** The minimum slope for metal roof panels shall comply with the following:

1. The minimum slope for lapped, nonsoldered seam metal roofs without applied lap sealant shall be three units vertical in 12 units horizontal (25-percent slope).
2. The minimum slope for lapped, nonsoldered seam metal roofs with applied lap sealant shall be one-half unit vertical in 12 units horizontal (4-percent slope). Lap sealants shall be applied in accordance with the approved manufacturer's installation instructions.
3. The minimum slope for standing seam of roof systems shall be one-quarter unit vertical in 12 units horizontal (2-percent slope).

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**1507.4.3 Material standards.** Metal-sheet roof covering systems that incorporate supporting structural members shall be designed in accordance with Chapter 22. Metal-sheet roof coverings installed over structural decking shall comply with Table 1507.4.3(1). The materials used for metal-sheet roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses shown in Table 1507.4.3(2).

**1507.4.4 Attachment.** Metal roof panels shall be secured to the supports in accordance with the approved manufacturers' fasteners. In the absence of manufacturer recommendations, the following fasteners shall be used:

1. Galvanized fasteners shall be used for steel roofs.
2. Copper, brass, bronze, copper alloy or 300 series stainless-steel fasteners shall be used for copper roofs.
3. Stainless-steel fasteners are acceptable for all types of metal roofs.

**1507.5 Metal roof shingles.** The installation of metal roof shingles shall comply with the provisions of this section.

**1507.5.1 Deck requirements.** Metal roof shingles shall be applied to a solid or closely fitted deck, except where the roof covering is specifically designed to be applied to spaced sheathing.

**1507.5.2 Deck slope.** Metal roof shingles shall not be installed on roof slopes below three units vertical in 12 units horizontal (25-percent slope).

**TABLE 1507.4.3(1)  
METAL ROOF COVERINGS**

ROOF COVERING TYPE	STANDARD APPLICATION RATE/THICKNESS
Aluminum	ASTM B 209, 0.024 inch minimum thickness for roll-formed panels and 0.019 inch minimum thickness for press-formed shingles.
Aluminum-zinc alloy coated steel	ASTM A 792 AZ 50
Cold-rolled copper	ASTM B 370 minimum 16 oz./sq. ft. and 12 oz./sq. ft. high yield copper for metal-sheet roof covering systems; 12 oz./sq. ft. for pre-formed metal shingle systems.
Copper	16 oz./sq. ft. for metal-sheet roof-covering systems; 12 oz./sq. ft. for preformed metal shingle systems.
Galvanized steel	ASTM A 653 G-90 zinc-coated <sup>a</sup>
Hard lead	2 lbs./sq. ft.
Lead-coated copper	ASTM B 101
Prepainted steel	ASTM A 755
Soft lead	3 lbs./sq. ft.
Stainless steel	ASTM A 240, 300 Series Alloys
Steel	ASTM A 924
Terne and terne-coated stainless	Terne coating of 40 lbs. per double base box, field painted where applicable in accordance with manufacturer's installation instructions.
Zinc	0.027 inch minimum thickness; 99.995% electrolytic high grade zinc with alloy additives of copper (0.08% - 0.20%), titanium (0.07% - 0.12%) and aluminum (0.015%).

For SI: 1 ounce per square foot = 0.0026 kg/m<sup>2</sup>,  
1 pound per square foot = 4.882 kg/m<sup>2</sup>, 1 inch = 25.4 mm,  
1 pound = 0.454 kg.

- a. For Group U buildings, the minimum coating thickness for ASTM A 653 galvanized steel roofing shall be G-60.

**TABLE 1507.4.3(2)  
MINIMUM CORROSION RESISTANCE**

55% Aluminum-zinc alloy coated steel	ASTM A 792 AZ 50
5% Aluminum alloy-coated steel	ASTM A 875 GF60
Aluminum-coated steel	ASTM A 463 T2 65
Galvanized steel	ASTM A 653 G-90
Prepainted steel	ASTM A 755 <sup>a</sup>

- a. Paint systems in accordance with ASTM A 755 shall be applied over steel products with corrosion resistant coatings complying with ASTM A 792, ASTM A 875, ASTM A 463 or ASTM A 653.

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**1507.5.3 Underlayment.** Underlayment shall comply with ASTM D 226, Type I or ASTM D 4869.

**1507.5.4 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet, shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.5.5 Material standards.** Metal roof shingle roof coverings shall comply with Table 1507.4.3(1). The materials used for metal-roof shingle roof coverings shall be naturally corrosion resistant or provided with corrosion resistance in accordance with the standards and minimum thicknesses specified in the standards listed in Table 1507.4.3(2).

**1507.5.6 Attachment.** Metal roof shingles shall be secured to the roof in accordance with the approved manufacturer's installation instructions.

**1507.5.7 Flashing.** Roof valley flashing shall be of corrosion-resistant metal of the same material as the roof covering or shall comply with the standards in Table 1507.4.3(1). The valley flashing shall extend at least 8 inches (203 mm) from the centerline each way and shall have a splash diverter rib not less than  $\frac{3}{4}$  inch (19.1 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). The metal valley flashing shall have a 36-inch-wide (914 mm) underlayment directly under it consisting of either one layer of underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D 1970, in addition to underlayment required for metal roof shingles. For slopes under seven units vertical in 12 units horizontal (58-percent slope), the metal valley flashing shall be solid cemented to the roofing underlayment or a self-adhering polymer bitumen sheet shall be installed.†

**1507.6 Mineral-surfaced roll roofing.** The installation of mineral-surfaced roll roofing shall comply with this section.

**1507.6.1 Deck requirements.** Mineral-surfaced roll roofing shall be fastened to solidly sheathed roofs.

**1507.6.2 Deck slope.** Mineral-surfaced roll roofing shall not be applied on roof slopes below one unit vertical in 12 units horizontal (8-percent slope).

**1507.6.3 Underlayment.** Underlayment shall comply with ASTM D 226, Type I or ASTM D 4869.

**1507.6.4 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet, shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.6.5 Material standards.** Mineral-surfaced roll roofing shall conform to ASTM D 3909 or ASTM D 6380.

**1507.7 Slate shingles.** The installation of slate shingles shall comply with the provisions of this section.

**1507.7.1 Deck requirements.** Slate shingles shall be fastened to solidly sheathed roofs.

**1507.7.2 Deck slope.** Slate shingles shall only be used on slopes of four units vertical in 12 units horizontal (4:12) or greater.

**1507.7.3 Underlayment.** Underlayment shall comply with ASTM D 226, Type I or ASTM D 4869.

**1507.7.4 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet, shall extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.7.5 Material standards.** Slate shingles shall comply with ASTM C 406.

**1507.7.6 Application.** Minimum headlap for slate shingles shall be in accordance with Table 1507.7.6. Slate shingles shall be secured to the roof with two fasteners per slate.

**TABLE 1507.7.6  
SLATE SHINGLE HEADLAP**

SLOPE	HEADLAP (inches)
4:12 < slope < 8:12	4
8:12 < slope < 20:12	3
slope ≥ 20:12	2

For SI: 1 inch = 25.4 mm.

**1507.7.7 Flashing.** Flashing and counterflashing shall be made with sheet metal. Valley flashing shall be a minimum of 15 inches (381 mm) wide. Valley and flashing metal shall be a minimum uncoated thickness of 0.0179-inch (0.455 mm) zinc-coated G90. Chimneys, stucco or brick walls shall have a minimum of two plies of felt for a cap flashing consisting of a 4-inch-wide (102 mm) strip of felt set in plastic cement and extending 1 inch (25 mm) above the first felt and a top coating of plastic cement. The felt shall extend over the base flashing 2 inches (51 mm).

**1507.8 Wood shingles.** The installation of wood shingles shall comply with the provisions of this section and Table 1507.8.

**1507.8.1 Deck requirements.** Wood shingles shall be installed on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners.

**TABLE 1507.8**  
**WOOD SHINGLE AND SHAKE INSTALLATION**

ROOF ITEM	WOOD SHINGLES	WOOD SHAKES
1. Roof slope	Wood shingles shall be installed on slopes of three units vertical in 12 units horizontal (3:12) or greater.	Wood shakes shall be installed on slopes of four units vertical in 12 units horizontal (4:12) or greater.
2. Deck requirement	—	—
Temperate climate	Shingles shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 1" × 4" nominal dimensions and shall be spaced on center equal to the weather exposure to coincide with the placement of fasteners.	Shakes shall be applied to roofs with solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 1" × 4" nominal dimensions and shall be spaced on center equal to the weather exposure to coincide with the placement of fasteners. When 1" × 4" spaced sheathing is installed at 10 inches, boards must be installed between the sheathing boards.
NYC	Ice forming along the eaves causing a backup of water.	Solid sheathing required.
3. Interlayment	No requirements.	Interlayment shall comply with ASTM D 226, Type 1.
4. Underlayment	—	—
Temperate climate	Underlayment shall comply with ASTM D 226, Type 1.	Underlayment shall comply with ASTM D 226, Type 1.
NYC	Ice forming along the eaves causing a backup of water.	An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall extend from the eave's edge to a point at least 24 inches inside the exterior wall line of the building.
5. Application	—	—
Attachment	Fasteners for wood shingles shall be hot-dipped galvanized or Type 304 (Type 316 for coastal areas) stainless steel with a minimum penetration of 0.75 inch into the sheathing. For sheathing less than 0.5 inch thick, the fasteners shall extend through the sheathing.	Fasteners for wood shakes shall be hot-dipped galvanized or Type 304 (Type 316 for coastal areas) with a minimum penetration of 0.75 inch into the sheathing. For sheathing less than 0.5 inch thick, the fasteners shall extend through the sheathing.
No. of fasteners	Two per shingle.	Two per shake.
Exposure	Weather exposures shall not exceed those set forth in Table 1507.8.7.	Weather exposures shall not exceed those set forth in Table 1507.9.8.
Method	Shingles shall be laid with a side lap of not less than 1.5 inches between joints in courses, and no two joints in any three adjacent courses shall be in direct alignment. Spacing between shingles shall be 0.25 to 0.375 inch.	Shakes shall be laid with a side lap of not less than 1.5 inches between joints in adjacent courses. Spacing between shakes shall not be less than 0.375 inch or more than 0.625 inch for shakes and tapersawn shakes of naturally durable wood and shall be 0.25 to 0.375 inch for preservative taper sawn shakes.
Flashing	In accordance with Section 1507.8.8.	In accordance with Section 1507.9.9.

For SI: 1 inch = 25.4 mm, °C = [(°F) – 32]/1.8.

**1507.8.1.1 Solid sheathing required.** Solid sheathing is required.

**1507.8.2 Deck slope.** Wood shingles shall be installed on slopes of three units vertical in 12 units horizontal (25-percent slope) or greater.

**1507.8.3 Underlayment.** Underlayment shall comply with ASTM D 226, Type I or ASTM D 4869.

**1507.8.4 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.8.5 Material standards.** Wood shingles shall be of naturally durable wood and comply with the requirements of Table 1507.8.5.

**TABLE 1507.8.5  
WOOD SHINGLE MATERIAL REQUIREMENTS**

MATERIAL	APPLICABLE MINIMUM GRADES	GRADING RULES
Wood shingles of naturally durable wood	1, 2 or 3	CSSB

CSSB = Cedar Shake and Shingle Bureau

**1507.8.6 Attachment.** Fasteners for wood shingles shall be corrosion resistant with a minimum penetration of  $\frac{3}{4}$  inch (19.1 mm) into the sheathing. For sheathing less than  $\frac{1}{2}$  inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shingle shall be attached with a minimum of two fasteners.

**1507.8.7 Application.** Wood shingles shall be laid with a side lap not less than  $1\frac{1}{2}$  inches (38 mm) between joints in adjacent courses, and not be in direct alignment in alternate courses. Spacing between shingles shall be  $\frac{1}{4}$  to  $\frac{3}{8}$  inches (6.4 to 9.5 mm). Weather exposure for wood shingles shall not exceed that set in Table 1507.8.7.

**1507.8.8 Flashing.** At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D 1970, in addition to other required underlayment. For slopes under seven units vertical in 12 units horizontal (58-percent slope), the metal valley flashing underlayment shall be solid cemented to the roofing underlayment

or a self-adhering polymer modified bitumen sheet shall be installed.†

**TABLE 1507.8.7  
WOOD SHINGLE WEATHER EXPOSURE AND ROOF SLOPE**

ROOFING MATERIAL	LENGTH (inches)	GRADE	EXPOSURE (inches)	
			3:12 pitch to < 4:12	4:12 pitch or steeper
Shingles of naturally durable wood	16	No. 1	3.75	5
		No. 2	3.5	4
		No. 3	3	3.5
	18	No. 1	4.25	5.5
		No. 2	4	4.5
		No. 3	3.5	4
	24	No. 1	5.75	7.5
		No. 2	5.5	6.5
		No. 3	5	5.5

For SI: 1 inch = 25.4 mm.

**1507.9 Wood shakes.** The installation of wood shakes shall comply with the provisions of this section and Table 1507.8.

**1507.9.1 Deck requirements.** Wood shakes shall only be used on solid or spaced sheathing. Where spaced sheathing is used, sheathing boards shall not be less than 1-inch by 4-inch (25 mm by 102 mm) nominal dimensions and shall be spaced on centers equal to the weather exposure to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sheathing is installed at 10 inches (254 mm) o.c., additional 1-inch by 4-inch (25 mm by 102 mm) boards shall be installed between the sheathing boards.

**1507.9.1.1 Solid sheathing required.** Solid sheathing is required in areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water.

**1507.9.2 Deck slope.** Wood shakes shall only be used on slopes of four units vertical in 12 units horizontal (33-percent slope) or greater.

**1507.9.3 Underlayment.** Underlayment shall comply with ASTM D 226, Type I or ASTM D 4869.

**1507.9.4 Ice barrier.** An ice barrier that consists of at least two layers of underlayment cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal underlayment and extend from the lowest edges of all roof surfaces to a point at least 24 inches (610 mm) inside the exterior wall line of the building.

**Exception:** Detached accessory structures that contain no conditioned floor area.

**1507.9.5 Interlayment.** Interlayment shall comply with ASTM D 226, Type I.

**1507.9.6 Material standards.** Wood shakes shall comply with the requirements of Table 1507.9.6.



**TABLE 1507.9.6**  
**WOOD SHAKE MATERIAL REQUIREMENTS**

MATERIAL	MINIMUM GRADES	APPLICABLE GRADING RULES
Wood shakes of naturally durable wood	1	CSSB
Taper sawn shakes of naturally durable wood	1 or 2	CSSB
Preservative-treated shakes and shingles of naturally durable wood	1	CSSB
Fire-retardant-treated shakes and shingles of naturally durable wood	1	CSSB
Preservative-treated taper sawn shakes of Southern pine treated in accordance with AWP A U1 (Commodity Specification A, Use Category 3B and Section 5.6)	1 or 2	TFS

CSSB = Cedar Shake and Shingle Bureau.

TFS = Forest Products Laboratory of the Texas Forest Services.

**1507.9.7 Attachment.** Fasteners for wood shakes shall be corrosion resistant with a minimum penetration of  $\frac{3}{4}$  inch (19.1 mm) into the sheathing. For sheathing less than  $\frac{1}{2}$  inch (12.7 mm) in thickness, the fasteners shall extend through the sheathing. Each shake shall be attached with a minimum of two fasteners.

**1507.9.8 Application.** Wood shakes shall be laid with a side lap not less than  $1\frac{1}{2}$  inches (38 mm) between joints in adjacent courses. Spacing between shakes in the same course shall be  $\frac{3}{8}$  to  $\frac{5}{8}$  inches (9.5 to 15.9 mm) for shakes and taper sawn shakes of naturally durable wood and shall be  $\frac{1}{4}$  to  $\frac{3}{8}$  inch (6.4 to 9.5 mm) for preservative taper sawn shakes. Weather exposure for wood shakes shall not exceed those set in Table 1507.9.8.

**TABLE 1507.9.8**  
**WOOD SHAKE WEATHER EXPOSURE AND ROOF SLOPE**

ROOFING MATERIAL	LENGTH (inches)	GRADE	EXPOSURE (inches) 4:12 PITCH OR STEEPER
Shakes of naturally durable wood	18	No. 1	7.5
	24	No. 1	10 <sup>a</sup>
Preservative-treated taper sawn shakes of Southern yellow pine	18	No. 1	7.5
	24	No. 1	10
	18	No. 2	5.5
	24	No. 2	7.5
Taper sawn shakes of naturally durable wood	18	No. 1	7.5
	24	No. 1	10
	18	No. 2	5.5
	24	No. 2	7.5

For SI: 1 inch = 25.4 mm.

a. For 24-inch by 0.375-inch handsplit shakes, the maximum exposure is 7.5 inches.

**1507.9.9 Flashing.** At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall not be less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend at least 11 inches (279 mm) from the centerline each way and

have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) underlayment of either one layer of Type I underlayment running the full length of the valley or a self-adhering polymer-modified bitumen sheet complying with ASTM D 1970, in addition to other required underlayment. For slopes under seven units vertical in 12 units horizontal (58-percent slope), the metal valley flashing underlayment shall be solidly cemented to the roofing underlayment or a self-adhering polymer-modified bitumen sheet shall be installed.‡

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**1507.10 Built-up roofs.** The installation of built-up roofs shall comply with the provisions of this section.

**1507.10.1 Slope.** Built-up roofs shall have a slope designed and built to provide positive roof drainage.

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**1507.10.2 Material standards.** Built-up roof covering materials shall comply with the standards in Table 1507.10.2.

**TABLE 1507.10.2**  
**BUILT-UP ROOFING MATERIAL STANDARDS**

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D 6083
Aggregate surfacing	ASTM D 1863
Asphalt adhesive used in roofing	ASTM D 3747
Asphalt cements used in roofing	ASTM D 3019; D 2822; D 4586
Asphalt-coated glass fiber base sheet	ASTM D 4601
Asphalt coatings used in roofing	ASTM D1227; D 2823; D 4479
Asphalt glass felt	ASTM D 2178
Asphalt primer used in roofing	ASTM D 41
Asphalt-saturated and asphalt-coated organic felt base sheet	ASTM D 2626
Asphalt-saturated organic felt (perforated)	ASTM D 226
Asphalt used in roofing	ASTM D 312
Coal-tar cements used in roofing	ASTM D 4022; D 5643
Coal-tar saturated organic felt	ASTM D 227
Coal-tar pitch used in roofing	ASTM D 450; Type I or II
Coal-tar primer used in roofing, damproofing and waterproofing	ASTM D 43
Glass mat, coal tar	ASTM D 4990
Glass mat, venting type	ASTM D 4897
Mineral-surfaced inorganic cap sheet	ASTM D 3909
Thermoplastic fabrics used in roofing	ASTM D 5665, D 5726

**1507.11 Modified bitumen roofing.** The installation of modified bitumen roofing shall comply with the provisions of this section.

**1507.11.1 Slope.** Modified bitumen membrane roofs shall have a slope designed and built to provide positive roof drainage.

**1507.11.2 Material standards.** Modified bitumen roof coverings shall comply with CGSB 37-GP-56M, ASTM D 6162, ASTM D 6163, ASTM D 6164, ASTM D 6222, ASTM D 6223, ASTM D 6298 and ASTM D 6509.

**1507.12 Thermoset single-ply roofing.** The installation of thermoset single-ply roofing shall comply with the provisions of this section.

**1507.12.1 Slope.** Thermoset single-ply membrane roofs shall have a slope designed and built to provide positive roof drainage.

**1507.12.2 Material standards.** Thermoset single-ply roof coverings shall comply with ASTM D 4637, ASTM D 5019 or CGSB 37-GP-52M.

**1507.12.3 Ballasted thermoset low-slope roofs.** Ballasted thermoset low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D 448.

**1507.13 Thermoplastic single-ply roofing.** The installation of thermoplastic single-ply roofing shall comply with the provisions of this section.

**1507.13.1 Slope.** Thermoplastic single-ply membrane roofs shall have a slope designed and built to provide positive roof drainage.

**1507.13.2 Material standards.** Thermoplastic single-ply roof coverings shall comply with ASTM D 4434, ASTM D 6754, ASTM D 6878 or CAN/CGSB 37-54.

**1507.13.3 Ballasted thermoplastic low-slope roofs.** Ballasted thermoplastic low-slope roofs (roof slope < 2:12) shall be installed in accordance with this section and Section 1504.4. Stone used as ballast shall comply with ASTM D 448.

**1507.14 Sprayed polyurethane foam roofing.** The installation of sprayed polyurethane foam roofing shall comply with the provisions of this section.

**1507.14.1 Slope.** Sprayed polyurethane foam roofs shall have a slope designed and built to provide positive roof drainage.

**1507.14.2 Material standards.** Spray-applied polyurethane foam insulation shall comply with Type III or IV as defined in ASTM C 1029.

**1507.14.3 Application.** Foamed-in-place roof insulation shall be installed in accordance with the manufacturer's instructions. A liquid-applied protective coating that complies with Section 1507.15 shall be applied no less than 2 hours nor more than 72 hours following the application of the foam.

**1507.14.4 Foam plastics.** Foam plastic materials and installation shall comply with Chapter 26.

**1507.15 Liquid-applied roofing.** The installation of liquid-applied roofing shall comply with the provisions of this section.

**1507.15.1 Slope.** Liquid-applied roofing shall have a slope designed and built to provide positive roof drainage.

**1507.15.2 Material standards.** Liquid-applied roofing shall comply with ASTM C 836, ASTM C 957, ASTM D 1227, ASTM D 3468, ASTM D 6083, ASTM D 6694 or ASTM D 6947.

**1507.16 Green roof systems.** The green roof system shall comply with the provisions of this section.

**1507.16.1 Design standards.** Green roof systems shall comply with ANSI/SPRI RP-14 and ANSI/SPRI VF-1, or with FM DS 1-35.

**Exceptions:**

1. The aggregate area of landscaping materials or growth media or both on any single roof level of a building or structure is 250 square feet (23.2 m<sup>2</sup>) or less.
2. The roof area is 22 feet (6706 mm) or less from grade.
3. The green roof system is a container garden.

**1507.16.2 Roof structure.** The roof structure shall comply with Chapter 16 for the design of the green roofs system.

**1507.16.3 Roof covering.** Roof covering shall comply with Section 1507.10, 1507.11, 1507.12, 1507.13, or 1507.15.

**1507.16.4 Slope.** The roofing membrane shall have a design slope in accordance with the roof covering utilized. Overburden shall be installed to prevent slippage.

**SECTION BC 1508  
ROOF INSULATION**

**1508.1 General.** The use of above-deck thermal insulation shall be permitted provided such insulation is covered with an approved roof covering and passes the tests of FM 4450 or UL 1256 when tested as an assembly.

**Exceptions:**

1. Foam plastic roof insulation shall conform to the material and installation requirements of Chapter 26.
2. Where a concrete roof deck is used and the above-deck thermal insulation is covered with an approved roof covering.

**1508.1.1 Cellulosic fiberboard.** Cellulosic fiberboard roof insulation shall conform to the material and installation requirements of Chapter 23.

**1508.2 Material standards.** Above-deck thermal insulation board shall comply with the standards in Table 1508.2.†

**TABLE 1508.2**  
**MATERIAL STANDARDS FOR ROOF INSULATION**

Cellular glass board	ASTM C 552
Composite boards	ASTM C 1289, Type III, IV, V or VI
Expanded polystyrene	ASTM C 578
Extruded polystyrene board	ASTM C 578
Perlite board	ASTM C 728
Polyisocyanurate board	ASTM C 1289, Type I or Type II
Wood fiberboard	ASTM C 208

## SECTION BC 1509 ROOFTOP STRUCTURES

**1509.1 General.** The provisions of this section shall govern the construction of rooftop structures. All rooftop structures shall be subject to the roof area coverage limitations and building height requirements of Chapter 5. Rooftop structures shall be constructed with materials as required for the building, except as provided for in this section.

**1509.2 Bulkheads and penthouses.** Bulkheads and penthouses shall comply with the construction requirements of Section 1509.2.

**1509.2.1 Type of construction.** Bulkheads and penthouses shall be constructed with walls, floors and roof as required for the building.

**Exceptions:** Where the total aggregate area of all rooftop structures does not exceed 33 percent of the area of the roof of the building upon which they are erected; the following shall apply:

1. Bulkheads on buildings of Type I and II construction. The exterior walls and roofs of such bulkheads with a fire separation distance of more than 5 feet (1524 mm) and less than 30 feet (9144 mm) shall be of at least 1-hour fire-resistance-rated noncombustible construction. Walls and roofs with a fire separation distance of 30 feet (9144 mm) or greater shall be of noncombustible construction. Interior framing and walls shall be of noncombustible construction.
2. Bulkheads on buildings of Type III, IV and V construction. The exterior walls of such bulkheads with a fire separation distance of more than 5 feet (1524 mm) and less than 30 feet (9144 mm) shall be at least 1-hour fire-resistance-rated construction. Walls with a fire separation distance of 30 feet (9144 mm) or greater from a common property line shall be of Type IV construction, or noncombustible construction. Roofs shall be constructed of materials and fire-resistance rated as required in Table 601 $\frac{1}{2}$ . Interior framing and walls shall be Type IV or noncombustible or fire-retardant-treated wood construction.
3. On one-story buildings, combustible unroofed mechanical equipment screens, fences or similar enclosures are permitted where located with a fire

separation distance of at least 20 feet (6096 mm) from adjacent property lines and where not exceeding 4 feet (1219 mm) in height above the roof surface.

**1509.2.2 Penthouses.** Enclosed walls of penthouses shall comply with the requirements for exterior walls as per Tables 601 and 602 for the construction class of the building on which they are erected. Roofs of penthouses shall comply with the requirements for roof construction of Table 601 and Chapter 15 of this code.

**1509.2.3 Bulkheads.** An enclosed rooftop structure not intended for human occupancy shall not be used for purposes other than shelter of mechanical equipment or shelter of vertical shaft openings in the roof. Provisions, such as louvers, louver blades or flashing, shall be made to protect the mechanical equipment and the building interior from the elements.

**1509.3 Tank supports.** Tanks having a capacity of more than 500 gallons (2 m<sup>3</sup>) placed in or on a building shall be supported on masonry, reinforced concrete, steel or Type IV construction provided that, where such supports are located in the building above the lowest story, the support shall be fire-resistance rated as required for Type IA construction.

**1509.3.1 Valve.** Such tanks shall have in the bottom or on the side near the bottom, a pipe or outlet, fitted with a suitable quick opening valve for discharging the contents in an emergency through an adequate drain.

**1509.3.2 Location.** Such tanks shall not be placed over or near a line of stairs or an elevator shaft, unless there is a solid roof or floor underneath the tank.

**1509.3.3 Tank cover.** Unenclosed roof tanks shall have covers sloping toward the outer edges.

**1509.4 Cooling towers.** Cooling towers in excess of 250 square feet (23.2 m<sup>2</sup>) in base area or in excess of 15 feet (4572 mm) high where located on building roofs more than 50 feet (15 240 mm) high shall be of noncombustible construction.

### Exceptions:

1. Drip boards and the enclosing construction of wood not less than 1 inch (25 mm) nominal thickness, provided the wood is covered on the exterior of the tower with noncombustible material.
2. Fill and drift eliminators may be of combustible material if the towers are provided with automatic sprinkler protection complying with Section 903 of this code.
3. Fill and drift eliminators that comply with Section 908 of the *New York City Mechanical Code*.

**1509.5 Steeples, minarets, spires, domes and cupolas.** Any steeple, minaret, spire, dome or cupola shall be of a type of construction not less in fire-resistance rating than required for the building to which it is attached except that any such steeple, minaret, spire, dome or cupola that exceeds 85 feet (25 908 mm) in height above grade plane, exceeds 200 square feet (18.6 m<sup>2</sup>) in horizontal area or is used for any purpose other



boarding, decking or platforms that do not cover more than 20 percent of the contiguous roof area at that level.

**NYC** steeple, minaret, spire, dome or cupola that exceeds 60 feet (18 288 mm) in height above the highest point at which it comes in contact with the roof, or that exceeds 200 square feet (18.6 m<sup>2</sup>) in area at any horizontal section, or which is intended to be used for any purpose other than a belfry or architectural embellishment, shall be entirely constructed of and supported by noncombustible materials. Such structures shall be separated from the building below by construction having a fire-resistance rating of not less than 1.5 hours with openings protected with a minimum 1.5-hour fire-protection rating. Such structures placed above the roof of any building more than 50 feet (15 240 mm) in height, shall be of noncombustible material and shall be supported by construction of noncombustible material.

**NYC** **1509.5.2 Steeples, minarets and spires.** Steeples, minarets, and spires where enclosed shall have exterior walls as required for the building to which they are attached. The roof covering of spires shall be of a class of roof covering as required for the main roof of the rest of the structure.

**1509.6 Dormers.** Dormers shall have exterior walls as required for the building to which they are attached. The roof covering of dormers shall be of a class of roof covering as required for the main roof of the rest of the structure.

**1509.7 Greenhouses.** Greenhouses used for the cultivation of plants, on the roofs of buildings other than buildings of Type V construction, shall be constructed of noncombustible framework and shall be glazed with plain or wire glass, or light transmitting plastic glazing complying with the requirements of Section 2606. The floors of greenhouses shall be constructed to be at least equal to the requirements for roof construction on Table 601 for the construction class of the building on which it is located.

**1509.8 Protective guards.** Buildings greater than 22 feet (6706 mm) in height with roof slopes less than 2.4 units vertical in 12 units horizontal (20-percent slope) shall be provided with a parapet, railing, fence, or combination thereof, not less than 42 inches (1067 mm) in height. Railings or fences may be located inward from the face of the exterior wall a distance not exceeding 6 feet (1829 mm). Railings or fences shall be of noncombustible material, except on buildings of Type V construction. Railings shall be constructed to comply with the requirements of Sections 1012 and 1607.7.

**1509.8.1 Fences on roofs used for recreational purposes.** Rooftops used for recreational purposes shall be provided with wire fencing at least 10 feet (3048 mm) in height. Openings in the fence shall not permit the passage of a 4-inch diameter (102 mm) sphere. Where ball games are played on rooftops the wire fencing shall be extended to provide an overhead closure.

**1509.9 Miscellaneous combustible roof structures.** The following roof structures may be constructed of combustible material if less than 12 feet (1658 mm) high above the roof: antenna supports; flagpoles; clothes drying frames; duck-

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- 1510.4 Roof recovering.** Where the application of a new roof covering over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with gypsum board, mineral fiber, glass fiber or other approved materials securely fastened in place.

**1510.5 Reinstallation of materials.** Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Aggregate surfacing materials shall not be reinstalled.

**1510.6 Flashings.** Flashings shall be reconstructed in accordance with approved manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.

## SOLAR PHOTOVOLTAIC PANELS/MODULES

**1511.1 Solar photovoltaic panels/modules.** Solar photovoltaic panels/modules installed upon a roof or as an integral part of a roof assembly shall comply with the requirements of this code and the *New York City Fire Code*.

**1511.1.1 Structural fire resistance.** The structural frame and roof construction supporting the load imposed upon the roof by the photovoltaic panels/modules shall comply with the requirements of Table 601.

# STRUCTURAL DESIGN

**SECTION BC 1601**  
**GENERAL**

**1601.1 Scope.** The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code. (*Note: Where the text in this Code refers to ASCE 7, the 2005 edition shall be used; and where the text in this Code refers to ASCE 7-10, the 2010 edition shall be used.*)

**1601.2 Special provisions for prior code buildings.** The provisions of Sections 1601.2.1 through 1601.2.4 shall apply to structural work on prior code buildings.

**1601.2.1 Use of this code.** Notwithstanding the applicant's election to use the *1968 Building Code* or prior code, the structural calculations shall be permitted to be performed in accordance with this code provided that the structural safety of the prior code building is not reduced. Notwithstanding the provisions of Section 28-101.4.4 of the *Administrative Code*, the use of Load and Resistance Factor Design (LRFD) engineering calculations shall not be deemed to reduce structural safety provided the properties of the existing materials are determined using accepted engineering principles.

**1601.2.2 Live loads.** Loads indicated in the applicable prior code shall be permitted for structural calculations using engineering formulas from this code provided that the structural safety of the prior code building is not reduced.

**1601.2.3 Seismic loads.** The determination as to whether seismic requirements apply to an alteration shall be made in accordance with the *1968 Building Code* and interpretations by the department relating to such determinations. Any applicable seismic loads and requirements, including for the bracing of architectural, mechanical, plumbing, fuel gas, fire suppression and electrical systems and equipment, shall be permitted to be determined in accordance with this chapter or the *1968 Building Code* and reference standard RS 9-6 of such code.

**1601.2.4 Wind loads.** All alterations, minor alterations, and ordinary repairs, to the extent of such work, shall be permitted to be performed in accordance with the wind load requirements set forth in the *1968 Building Code*, or where the *1968 Building Code* so authorizes, the code in effect prior to December 6, 1968.

### Exceptions:

1. Equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures determined in accordance with Section 1609.
2. Wind loads on glass shall not be permitted to be calculated in accordance with the code in effect prior to December 6, 1968.

3. When the wind surface area of a prior code building or structure is increased by more than 5 percent in any direction or there is a permanent decrease of the lateral force capacity by more than 20 percent in any direction, the entire building or structure shall be designed to resist the design wind load as calculated pursuant to the applicable code, but not less than 5 psf (0.24 kN/m<sup>2</sup>).

## SECTION BC 1602

### DEFINITIONS AND NOTATIONS

**1602.1 Definitions.** The following words and terms shall, for the purposes of this code, have the meanings shown herein.

**ALLOWABLE STRESS DESIGN.** A method of proportioning structural members, such that elastically computed stresses produced in the members by nominal loads do not exceed specified allowable stresses (also called “working stress design”).

**BALCONY, EXTERIOR.** See ASCE 7.

**DEAD LOADS.** The weight of materials of construction incorporated into the building, including but not limited to walls, floors, roofs, ceilings, stairways, built-in partitions, finishes, cladding and other similarly incorporated architectural and structural items, and the weight of fixed service equipment, such as cranes, plumbing stacks and risers, electrical feeders, heating, ventilating and air-conditioning systems and automatic sprinkler systems.

**DECK.** See ASCE 7.

**DESIGN STRENGTH.** The product of the nominal strength and a resistance factor (or strength reduction factor).

**DIAPHRAGM.** A horizontal or sloped system acting to transmit lateral forces to the vertical-resisting elements. When the term “diaphragm” is used, it shall include horizontal bracing systems.

**Diaphragm, blocked.** In light-frame construction, a diaphragm in which all sheathing edges not occurring on a framing member are supported on and fastened to blocking.

**Diaphragm boundary.** In light-frame construction, a location where shear is transferred into or out of the diaphragm sheathing. Transfer is either to a boundary element or to another force-resisting element.

**Diaphragm chord.** A diaphragm boundary element perpendicular to the applied load that is assumed to take axial stresses due to the diaphragm moment.

**Diaphragm, flexible.** A diaphragm is flexible for the purpose of distribution of story shear and torsional moment where so indicated in Section 12.3.1 of ASCE 7-10.

**Diaphragm, rigid.** A diaphragm is rigid for the purpose of distribution of story shear and torsional moment when the lateral deformation of the diaphragm is less than or equal to two times the average story drift.

**DURATION OF LOAD.** The period of continuous application of a given load, or the aggregate of periods of intermittent applications of the same load.

**ESSENTIAL FACILITIES.** Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes.

**FABRIC PARTITION.** A partition consisting of a finished surface made of fabric, without a continuous rigid backing, that is directly attached to a framing system in which the vertical framing members are spaced greater than 4 feet (1219 mm) on center.

**FACTORED LOAD.** The product of a nominal load and a load factor.

**GUARD.** See Section 1002.1.

**IMPACT LOAD.** The load resulting from moving machinery, elevators, craneways, vehicles and other similar forces and kinetic loads, pressure and possible surcharge from fixed or moving loads.

**LIMIT STATE.** A condition beyond which a structure or member becomes unfit for service and is judged to be no longer useful for its intended function (serviceability limit state) or to be unsafe (strength limit state).

**LIVE LOADS.** Those loads produced by the use and occupancy of the building or other structure and do not include construction or environmental loads such as wind load, snow load, rain load, earthquake load, flood load or dead load.

**LIVE LOADS (ROOF).** Those loads produced (1) during maintenance by workers, equipment and materials; and (2) during the life of the structure by movable objects such as planters and by people.

**LOAD AND RESISTANCE FACTOR DESIGN (LRFD).** A method of proportioning structural members and their connections using load and resistance factors such that no applicable limit state is reached when the structure is subjected to appropriate load combinations. The term “LRFD” is used in the design of steel and wood structures.

**LOAD EFFECTS.** Forces and deformations produced in structural members by the applied loads.

**LOAD FACTOR.** A factor that accounts for deviations of the actual load from the nominal load, for uncertainties in the analysis that transforms the load into a load effect, and for the probability that more than one extreme load will occur simultaneously.

**LOADS.** Forces or other actions that result from the weight of building materials, occupants and their possessions, environmental effects, differential movement and restrained dimensional changes. Permanent loads are those loads in which variations over time are rare or of small magnitude, such as dead loads. All other loads are variable loads (see also “Nominal loads”).

**NOMINAL LOADS.** The magnitudes of the loads specified in this chapter (dead, live, soil, wind, snow, rain, flood and earthquake).

#### NOTATIONS.

$D$  = Dead load.

$E$  = Combined effect of horizontal and vertical earthquake-induced forces as defined in Section 12.4.2 of ASCE 7-10.

$F$  = Load due to fluids with well-defined pressures and maximum heights.

$F_a$  = Flood load in accordance with Chapter 5 of ASCE 7.

$H$  = Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.

$L$  = Live load, except roof live load, including any permitted live load reduction.

$L_r$  = Roof live load including any permitted live load reduction.

plf = pounds per linear foot.

psig = pounds per square inch gauge.

$R$  = Rain load.

$S$  = Snow load.

$T$  = Self-straining force arising from contraction or expansion resulting from temperature change, shrinkage, moisture change, creep in component materials, movement due to differential settlement or combinations thereof.

$W$  = Load due to wind pressure.

**OTHER STRUCTURES.** Structures, other than buildings, for which loads are specified in this chapter.

**PANEL (PART OF A STRUCTURE).** The section of a floor, wall or roof comprised between the supporting frame of two adjacent rows of columns and girders or column bands of floor or roof construction.

**RESISTANCE FACTOR.** A factor that accounts for deviations of the actual strength from the nominal strength and the manner and consequences of failure (also called “strength reduction factor”).

**RISK CATEGORY.** See definition for “Structural Occupancy Category.”

**STRENGTH, NOMINAL.** The capacity of a structure or member to resist the effects of loads, as determined by computations using specified material strengths and dimensions and equations derived from accepted principles of structural mechanics or by field tests or laboratory tests of scaled models, allowing for modeling effects and differences between laboratory and field conditions.

**STRENGTH, REQUIRED.** Strength of a member, cross section or connection required to resist factored loads or related internal moments and forces in such combinations as stipulated by these provisions.

**STRENGTH DESIGN.** A method of proportioning structural members such that the computed forces produced in the members by factored loads do not exceed the member

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**VEHICLE BARRIER SYSTEM.** A system of building components near open sides of a garage floor or ramp or building walls that act as restraints for vehicles.

**NYC 1603.1 General.** Construction documents shall include drawings that show the sizes, sections and relative locations of structural members with floor levels, column centers and offsets fully dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be clearly indicated on the such drawings of parts of the building or structure.

1. Floor and roof live loads.
2. Ground snow load,  $P_g$ .
3. Basic wind speed (3-second gust), miles per hour (mph) (km/hr) and wind exposure.
4. Seismic design category and site class.
5. Flood design data, if located in flood hazard areas established in Section G102.2 of Appendix G.
6. Design load-bearing values of soils or rock under shallow foundations and/or the design load capacity of deep foundations.

NYC **1603.1.2 Partition loads.** The equivalent uniform parti-  
 NYC tion loads or, in lieu of these, a statement to the effect that  
 NYC the design was predicated on actual partition loads.  
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**1603.1.4 Roof snow load.** The ground snow load,  $P_g$ , shall be indicated. The following additional information shall also be provided, regardless of whether snow loads govern the design of the roof:

- 1603.1.5 Wind design data.** The following information related to wind loads shall be shown, regardless of whether wind loads govern the design of the lateral-force-resisting system of the building:

- 1603.1.6 Earthquake design data.** The following information related to seismic loads shall be shown, regardless of whether seismic loads govern the design of the lateral-force-resisting system of the building:

- 1603.1.7 Geotechnical information.** The design load-bearing values of soils or rock under shallow foundations and/or the design load capacity of deep foundations shall be shown on the construction drawings.

**1603.1.8 Flood load.** Buildings and other structures located in areas of special flood hazard shall meet the design requirements of Section 5.3 of ASCE 7. The structural design shall be based on the design loads stated in Section 5.4 of ASCE 7.

**1603.1.9 Special loads.** Special loads that are applicable to the design of the building, structure or portions thereof shall be indicated along with the specified section of this code that addresses the special loading condition.

**1603.1.10 Superimposed dead loads.** The uniformly distributed superimposed dead loads used in the design shall be indicated for floor and roof areas.

**1603.1.11 Other loads.** Other loads used in the design, including but not limited to the loads of machinery or equipment, which are of greater magnitude than the loads



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defined in the specified floor and roof loads shall be indicated by their descriptions and locations.

### SECTION BC± 1604 GENERAL DESIGN REQUIREMENTS

**1604.1 General.** Building, structures and parts thereof shall be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable material chapters.

**1604.2 Strength.** Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction. Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the commissioner.

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**1604.3 Serviceability.** Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift. See Section 12.12.1 of ASCE 7-10 for drift limits applicable to earthquake loading.

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**1604.3.1 Deflections.** The deflections of structural members shall not exceed the more restrictive of the limita-

tions of Sections 1604.3.2 through 1604.3.5 or that permitted by Table 1604.3.

**1604.3.2 Reinforced concrete.** The deflection of reinforced concrete structural members shall not exceed that permitted by ACI 318.

**1604.3.3 Steel.** The deflection of steel structural members shall not exceed that permitted by AISC 360, AISI HSS S 100, ASCE 3, ASCE 8 and SJI CJ-1.0, SJI JG-1.1, SJI K-1.1 or SJI LH/DLH-1.1, as applicable.

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**1604.3.4 Masonry.** The deflection of masonry structural members shall not exceed that permitted by TMS 402/ACI 530/ASCE 5.

**1604.3.5 Aluminum.** The deflection of aluminum structural members shall not exceed that permitted by AA ADM1.

**1604.3.6 Limits.** For limits on the deflection of structural members, refer to the relevant material design standards. Should a design standard not provide for deflection limits, deflection of structural members over span,  $l$ , shall not exceed that permitted by Table 1604.3.

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**1604.4 Analysis.** Load effects on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their

**TABLE 1604.3**  
**DEFLECTION LIMITS<sup>a, b, c, h, i</sup>**

CONSTRUCTION	$L$	$S$ or $W^f$	$D + L^{d, g}$
Roof members: <sup>c</sup>			
Supporting plaster ceiling	$l/360$	$l/360$	$l/240$
Supporting nonplaster ceiling	$l/240$	$l/240$	$l/180$
Not supporting ceiling	$l/180$	$l/180$	$l/120$
Floor members	$l/360$	—	$l/240$
Exterior walls and interior partitions:			
With brittle finishes	—	$l/120$	—
With flexible finishes	—	$l/120$	—
Farm buildings	—	—	$l/180$
Greenhouses	—	—	$l/120$

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For SI: 1 foot = 304.8 mm.

- For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed  $l/60$ . For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed  $l/150$ . For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed  $l/90$ . For roofs, this exception only applies when the metal sheets have no roof covering.
- Interior partitions not exceeding 6 feet in height and flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.13.
- See Section 2403 for glass supports.
- For wood structural members having a moisture content of less than 16 percent at time of installation and used under dry conditions, the deflection resulting from  $L + 0.5D$  is permitted to be substituted for the deflection resulting from  $L + D$ .
- The above deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to assure adequate drainage shall be investigated for ponding. See Section 1611 for rain and ponding requirements and Section 1503.4 for roof drainage requirements.
- The wind load is permitted to be taken as 0.7 times the "component and cladding" loads for the purpose of determining deflection limits herein.
- For steel structural members, the dead load shall be taken as zero.
- For aluminum structural members or aluminum panels used in roofs or walls of sunroom additions or patio covers, not supporting edge of glass or aluminum sandwich panels, the total load deflection shall not exceed  $l/60$ . For aluminum sandwich panels used in roofs or walls of sunroom additions or patio covers, the total load deflection shall not exceed  $l/120$ .
- For cantilever members,  $l$  shall be taken as twice the length of the cantilever.

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NYC service life. Secondary stresses in trusses shall be considered  
 NYC and, where of significant magnitude, their effects shall be  
 NYC provided for in the design.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

NYC The total lateral force shall be distributed to the various  
 NYC vertical elements of the lateral-force-resisting system in proportion to their rigidities considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements that are assumed not to be a part of the lateral-force-resisting system shall be permitted to be incorporated into buildings provided that their effect on the action of the system is considered and provided for in the design. Except where diaphragms are

flexible, or are permitted to be analyzed as flexible, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral-force-resisting system.

Every structure shall be designed to resist the overturning effects caused by the lateral forces specified in this chapter. See Section 1609 for wind loads, Section 1610 for lateral soil loads and Section 1613 for earthquake loads.

**1604.5 Structural occupancy category.** Each building and structure shall be assigned a structural occupancy category in accordance with Table 1604.5. NYC

**1604.5.1 Multiple occupancies.** Where a building or structure is occupied by two or more occupancies not included in the same structural occupancy category, it NYC

**TABLE 1604.5**  
**STRUCTURAL OCCUPANCY/RISK CATEGORY AND IMPORTANCE FACTORS**

STRUCTURAL <sup>‡</sup> OCCUPANCY/RISK CATEGORY <sup>a</sup>	NATURE OF OCCUPANCY/RISK	NYC NYC NYC
I	Buildings and other structures that represent a low hazard to human life in the event of failure including, but not limited to: <ol style="list-style-type: none"> <li>1. Agricultural facilities</li> <li>2. Certain temporary facilities</li> <li>3. Minor storage facilities</li> </ol>	
II	Buildings and other structures except those listed in Structural <sup>‡</sup> Occupancy/Risk Categories I, III and IV	NYC
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure including, but not limited to: <ol style="list-style-type: none"> <li>1. Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.</li> <li>2. Buildings and other structures containing elementary school, secondary school or day-care facilities with an occupant load greater than 250.</li> <li>3. Buildings and other structures containing adult education facilities, such as colleges and universities with an occupant load greater than 500.</li> <li>4. Group I-2 occupancies with an occupant load of 50 or more resident patients but not having surgery or emergency treatment facilities.</li> <li>5. Group I-3 occupancies.</li> <li>6. Any other occupancy with an occupant load greater than 5,000.</li> <li>7. Power-generating stations, water treatment for potable water, waste-water treatment facilities and other public utility facilities not included in Structural<sup>‡</sup> Occupancy/Risk Category IV.</li> <li>8. Buildings and other structures not included in Structural<sup>‡</sup> Occupancy/Risk Category IV containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.</li> </ol>	NYC NYC NYC NYC
IV	Buildings and other structures designed as essential facilities including, but not limited to: <ol style="list-style-type: none"> <li>1. Group I-2 occupancies having surgery or emergency treatment facilities.</li> <li>2. Fire, rescue, ambulance and police stations and emergency vehicle garages.</li> <li>3. Designated earthquake, hurricane or other emergency shelters.</li> <li>4. Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response.</li> <li>5. Power-generating stations and other public utility facilities required as emergency backup facilities for Structural Occupancy/Risk Category IV structures.</li> <li>6. Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.7(2).</li> <li>7. Aviation control towers, air traffic control centers and emergency aircraft hangars.</li> <li>8. Buildings and other structures having critical national defense functions.</li> <li>9. Water storage facilities and pump structures required to maintain water pressure for fire suppression.</li> </ol>	NYC NYC

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.1 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.<sup>‡</sup>

shall be assigned the classification of the highest structural occupancy category corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher structural occupancy category, both portions shall be assigned to the higher structural occupancy category.

**1604.5.2 Importance factors.** Importance factors for snow, wind and seismic loads shall be determined in accordance with Table 1604.5.2 based on the Structural Occupancy Category or Risk Category assigned in accordance with Table 1604.5.

**TABLE 1604.5.2  
IMPORTANCE FACTORS**

STRUCTURAL OCCUPANCY/RISK CATEGORY	SNOW IMPORTANCE FACTOR, <i>I</i>	WIND IMPORTANCE FACTOR, <i>I</i>	SEISMIC IMPORTANCE FACTOR, <i>I</i>
I	0.80	0.87	1.00
II	1.00	1.00	1.00
III	1.10	1.15	1.25
IV	1.20	1.15	1.50

**1604.6 In-situ load tests.** The commissioner is authorized to require an engineering analysis or a load test, or both, of any construction whenever there is reason to question the safety of the construction for the intended occupancy. Engineering analysis and load tests shall be conducted in accordance with Section 1714.

**1604.7 Preconstruction load tests.** Materials and methods of construction that are not capable of being designed by recognized engineering analysis or that do not comply with the applicable material design standards listed in Chapter 35, or alternative test procedures in accordance with Section 1712, shall be load tested in accordance with Section 1715.

#### **1604.8 Anchorage.**

**1604.8.1 General.** Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed loads.

**1604.8.2 Walls.** Walls shall be anchored to floors, roofs and other structural elements that provide lateral support for the wall. Such anchorage shall provide a positive direct connection capable of resisting the horizontal forces specified in this chapter but not less than the minimum strength design horizontal force specified in Section 11.7.3 of ASCE 7, substituted for "E" in the load combinations of Section 1605.2 or 1605.3. Concrete and masonry walls shall be designed to resist bending between anchors where the anchor spacing exceeds 4 feet (1219 mm). Required anchors in masonry walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Section 1609 for wind design requirements and Section 1613 for earthquake design requirements.

**1604.8.3 Decks.** Where supported by attachment to an exterior wall, decks shall be positively anchored to the primary structure and designed for both vertical and lateral loads as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary building structure cannot be verified during inspection, decks shall be self-supporting. Connections of decks with cantilevered framing members to exterior walls or other framing members shall be designed for both of the following:‡

1. The reactions resulting from the dead load and live load specified in Table 1607.1, or the snow load specified in Section 1608, in accordance with Section 1605, acting on all portions of the deck.
2. The reactions resulting from the dead load and live load specified in Table 1607.1, or the snow load specified in Section 1608, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no live load or snow load on the remaining portion of the deck.

**1604.9 Counteracting structural actions.** Structural members, systems, components and cladding shall be designed to resist forces due to earthquake and wind, with consideration of overturning, sliding and uplift. Continuous load paths shall be provided for transmitting these forces to the foundation. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

**1604.10 Wind and seismic detailing.** Lateral-force-resisting systems shall meet seismic detailing requirements and limitations prescribed in this code and ASCE 7-10, excluding ASCE 7-10 Chapter 14 and ASCE 7-10 Appendix 11A, even when wind load effects are greater than seismic load effects.‡

## **SECTION BC 1605 LOAD COMBINATIONS**

**1605.1 General.** Buildings and other structures and portions thereof shall be designed to resist:‡

1. The load combinations specified in Section 1605.2 or 1605.3;
2. The load combinations specified in Chapters 18 through 23; and
3. The load combinations with overstrength factors specified in Section 12.4.3.2 of ASCE 7-10, where required by Section 12.2.5.2, 12.3.3.3 or 12.10.2.1 of ASCE 7-10. With the simplified procedure of ASCE 7-10 Section 12.14, the load combinations with overstrength factors specified in Section 12.14.3.2 of ASCE 7-10 shall be used.

Applicable loads shall be considered, including both earthquake and wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.

Where the load combinations with overstrength factor in Section 12.4.3.2 of ASCE 7-10 apply, they shall be used as follows:

1. The basic combinations for strength design with overstrength factor in lieu of Equations 16-5 and 16-7 in Section 1605.2.1.
2. The basic combinations for allowable stress design with overstrength factor in lieu of Equations 16-12, 16-13 and 16-15 in Section 1605.3.1.

**1605.1.1 Stability.** Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in Section 1605.2 or 1605.3 shall be permitted. Where the load combinations specified in Section 1605.2 are used, strength reduction factors applicable to soil resistance shall be provided by a registered design professional. The stability of retaining walls shall be verified in accordance with Section 1806.2.

### 1605.2 Load combinations using strength design or load and resistance factor design.

**1605.2.1 Basic load combinations.** Where strength design or load and resistance factor design is used, structures and portions thereof shall resist the most critical effects from the following combinations of factored loads:

$$1.4D + F \quad (\text{Equation 16-1})$$

$$1.2(D + F + T) + 1.6(L + H) + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-2})$$

$$1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (f_1 L \text{ or } 0.8W) \quad (\text{Equation 16-3})$$

$$1.2D + 1.6W + f_1 L + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-4})$$

$$1.2D + 1.0E + f_1 L + f_2 S \quad (\text{Equation 16-5})$$

$$0.9D + 1.6W + 1.6H \quad (\text{Equation 16-6})$$

$$0.9D + 1.0E + 1.6H \quad (\text{Equation 16-7})$$

where:

$f_1 = 1.0$  for floors in places of public assembly, for live loads in excess of 100 pounds per square foot (4.79 kN/m<sup>2</sup>), and for parking garage live load, and  
 $= 0.5$  for other live loads.

$f_2 = 0.7$  for roof configurations (such as saw tooth) that do not shed snow off the structure, and  
 $= 0.2$  for other roof configurations.

**Exception:** Where other factored load combinations are specifically required by the provisions of this code, such combinations shall take precedence.

**1605.2.2 Other loads.** Where a structure is located in a V zone or Coastal A zone and  $F_a$  is to be considered in design, in addition to the load combinations of Equations 16-1 through 16-7, the structure and portions thereof shall resist the most critical effects of the load combinations of Equations 16-8 and 16-10.‡ Where a structure is located in an A zone and  $F_a$  is to be considered in design, in addition to the load combinations of Equations 16-1 through 16-7, structures and portions thereof shall resist the most critical

effects of the load combinations of Equations 16-9 and 16-11. Where ice loads are to be considered in design, the load combinations of Section 2.3.4 of ASCE 7 shall be used. Refer to the following sections for other load combinations:

### Flood Load Combinations:

$$1.2D + 1.6W + 2.0F_a + f_1 L + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-8})$$

$$1.2D + 8W + 1.0F_a + f_1 L + 0.5(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-9})$$

$$0.9D + 1.6W + 2.0F_a + 1.6H \quad (\text{Equation 16-10})$$

$$0.9D + 0.8W + 1.0F_a + 1.6H \quad (\text{Equation 16-11})$$

### 1605.3 Load combinations using allowable stress design.

**1605.3.1 Basic load combinations.** Where allowable stress design (working stress design), as permitted by this code, is used, structures and portions thereof shall resist the most critical effects resulting from the following combinations of loads:

$$D + F \quad (\text{Equation 16-12})$$

$$D + H + F + L + T \quad (\text{Equation 16-13})$$

$$D + H + F + (L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-14})$$

$$D + H + F + 0.75(L + T) + 0.75(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-15})$$

$$D + F + H + (W \text{ or } 0.7E) \quad (\text{Equation 16-16})$$

$$D + H + F + 0.75(W \text{ or } 0.7E) + 0.75L + 0.75(L_r \text{ or } S \text{ or } R) \quad (\text{Equation 16-17})$$

$$0.6D + W + H \quad (\text{Equation 16-18})\ddagger$$

$$0.6D + 0.7E + H \quad (\text{Equation 16-19})\ddagger$$

### Exceptions:

1. Crane hook loads need not be combined with roof live load or with more than three-fourths of the snow load or one-half of the wind load.
2. Flat roof snow loads of 30 psf (1.44 kN/m<sup>2</sup>) or less need not be combined with seismic loads. Where flat roof snow loads exceed 30 psf (1.44 kN/m<sup>2</sup>), 20 percent shall be combined with seismic loads.

**1605.3.1.1 Stress increases.** Increases in allowable stresses specified in the appropriate material chapter or the referenced standards shall not be used with the load combinations of Section 1605.3.1, except that increases shall be permitted in accordance with Chapter 23.

**1605.3.1.2 Other loads.** Where a structure is located in a V zone or Coastal A zone and  $F_a$  is to be considered in design, in addition to load combinations of Equations 16-12 through 16-19, structures and portions thereof shall resist the most critical effects of load combinations of Equations 16-20, 16-22 and 16-24. Where a structure is located in an A zone and  $F_a$  is to be considered in design, in addition to load combinations of Equations 16-12 through 16-19, structures and portions thereof shall resist the most critical effects of load com-



$$0.6D + W + H + 0.75F_a \quad \text{(Equation 16-25)}$$
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**TABLE 1607.1**  
**MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS<sup>f,1</sup>**

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)	NYC
1. Apartments (see residential)	—	—	
2. Access floor systems			
Office use	50	2,000	
Computer use	100	2,000	
3. Armories and drill rooms	150	—	
4. Assembly areas and theaters			
Fixed seats (fastened to floor)	60		
Lobbies	100		
Movable seats	100		
Private assembly spaces, including conference rooms	50	—	NYC
Stages and platforms	125		
Follow spot, projections and control rooms	50		
Catwalks	40		NYC
Other assembly spaces	Note h		NYC
5. Balconies (exterior) and Decks <sup>g,†</sup>	1.5 times the live load for the occupancy served. Not required to exceed 100 psf	—	NYC NYC NYC NYC
6. Bowling alleys	75	—	
7. Cornices	60	—	
8. Corridors, except as otherwise indicated	100	—	
†9. Dance halls and ballrooms	100	—	
10. Dining rooms and restaurants	100	—	
11. Dwellings (see residential)	—	—	
12. Elevator machine room grating (on area of 4 in. <sup>2</sup> )	—	300	
13. Equipment rooms, including pump rooms, generator rooms, transformer vaults, and areas for switch gear, ventilating, air conditioning, and similar electrical and mechanical equipment	75	—	NYC NYC NYC NYC
14. Finish light floor plate construction (on area of 1 in. <sup>2</sup> )	—	200	
15. Fire escapes (exterior)	100		
On single- and multiple family dwellings	40	—	
16. Garages (passenger vehicles only)	40	Note a	
Trucks and buses	See Section 1607.6	See Section 1607.6	
17. Grandstands (see stadium and arena bleachers)	—	—	
18. Gymnasiums, main floors and balconies	100	—	
19. Handrails, guards and grab bars	See Section 1607.7		
20. Hospitals			
Operating rooms, laboratories	60	1,000	
Private rooms	40	1,000	
Wards	40	1,000	
Corridors above first floor	80	1,000	NYC
21. Hotels (see residential)	—	—	
22. Libraries			
Reading rooms	60	1,000	
Stack rooms	150 <sup>b</sup>	1,000	
Corridors above first floor	80	1,000	

(continued)

**TABLE 1607.1—continued**  
**MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS<sup>f, i</sup>**

	OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
	23. Manufacturing		
	Light	125	2,000
	Heavy	250	3,000
	24. Marquees	75	—
	25. Office buildings		
	File and computer rooms shall be designed for heavier loads based on anticipated occupancy		
	Lobbies and first-floor corridors	100	2,000
	Offices	50	2,000
	Corridors above first floor	80	2,000
	26. Penal institutions		
	Cell blocks	40	—
	Corridors	100	—
	27. Residential		
	One- and two-family dwellings		
	Uninhabitable attics without storage	10	
	Uninhabitable attics with storage	20	
	Habitable attics and sleeping areas	30	—
	All other areas except balconies and decks	40	
	Hotels and multifamily dwellings		
	Private rooms and corridors serving them	40	
	Public rooms and corridors serving them	100	
	28. Reviewing stands, grandstands and bleachers	Note c	—
	29. Roofs		
	All roof surfaces subject to maintenance workers	5	300
	Awnings and canopies		
	Fabric construction supported by a lightweight rigid skeleton structure	Nonreducible	
	All other construction	20	
	Ordinary flat, pitched, and curved roofs		
	Primary roof members, exposed to a work floor		
	Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs;	Note j	2,000
	Over manufacturing, storage warehouses, and repair garages	60	300
	All other occupancies	100	Note j
	Roofs used for other special purposes		
	Roofs used for promenade purposes		
	Roofs used for roof gardens or assembly purposes		
	30. Schools		
	Classrooms	40	1,000
	Corridors above the first floor	80	1,000
	First-floor corridors	100	1,000
	31. Scuttles, skylight ribs and accessible ceilings	—	200
NYC	32. Sidewalks, vehicular driveways and yards, subject to trucking	300	8,000 <sup>d</sup> or 20,000 <sup>d</sup>
NYC	33. Plaza areas (open) accessible to the public (including landscaped portions)	100	—
	34. Skating rinks	100	—

(continued)

**TABLE 1607.1—continued**  
**MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS<sup>f, i</sup>**

OCCUPANCY OR USE	UNIFORM (psf)	CONCENTRATED (lbs.)
35. Stadiums and arenas Bleachers Fixed seats (fastened to floor)	100 <sup>c</sup> 60 <sup>c</sup>	—
36. Stairs and exits One- and two-family dwellings All other	100 40 100	Note e
37. Storage warehouses (shall be designed for heavier loads if required for anticipated storage) Light Heavy	125 250	— —
38. Stores Retail First floor Upper floors Wholesale, all floors	100 75 125	1,000 1,000 1,000
39. Vehicle barriers	See Section 1607.7	
40. Walkways and elevated platforms (other than exitways)	60	—
41. Yards and terraces, pedestrians	100	—

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**Notes to Table 1607.1**

For SI:

1 inch = 25.4 mm,

1 square inch = 645.16 mm<sup>2</sup>,

1 pound per square foot = 0.0479 kN/m<sup>2</sup>,

1 pound = 0.004448 kN,

1 pound per cubic foot = 16 kg/m<sup>3</sup>.

- a. Floors in garages or portions of buildings used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 1607.1 or the following concentrated loads: (1) for garages restricted to vehicles accommodating not more than nine passengers, 3,000 pounds acting on an area of 4.5 inches by 4.5 inches; (2) for mechanical parking structures without slab or deck which are used for storing passenger vehicles only, 2,250 pounds per wheel.
- b. The loading applies to stack room floors that support nonmobile, double-faced library bookstacks, subject to the following limitations:
  1. The nominal bookstack unit height shall not exceed 90 inches;
  2. The nominal shelf depth shall not exceed 12 inches for each face; and
  3. Parallel rows of double-faced bookstacks shall be separated by aisles not less than 36 inches wide.
- c. Design in accordance with the ICC *Standard on Bleachers, Folding and Telescopic Seating and Grandstands*.
- d. The concentrated wheel load shall be applied as follows 8,000 pounds on an area of 20 square inches, 20,000 pounds on an area of 20 inch by 10 inch area.
- e. ‡Minimum concentrated load on stair treads (on area of 4 square inches) is 300 pounds.
- f. ‡Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the commissioner (see Section 1608). For special-purpose roofs, see Section 1607.11.2.2.
- g. ‡See Section 1604.8.3 for decks attached to exterior walls.
- h. ‡Live loads for assembly spaces other than those described in this table shall be determined from the occupant load requirements as established by Section 1004 of this code using the formula 1,000/(net floor area per occupant) but shall not be less than 50 psf nor more than 100 psf.
- i. ‡For establishing live loads for occupancies not specifically listed herein, refer to Referenced Standard ASCE 7 for guidance.
- j. Roofs used for other special purposes shall be designed for appropriate loads as approved by the commissioner.

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**1607.2 Loads not specified.** For occupancies or uses not designated in Table 1607.1, the live load shall be determined in accordance with a method approved by the commissioner.

**1607.2.1 Stage areas using scenery or scenic elements.**

Scenery battens and suspension systems shall be designed for a load of 30 pounds per linear foot (437.7 N/m) of batten length. Loft block and head block beams shall be designed to support vertical and horizontal loads corresponding to a 4-inch (102 mm) spacing of battens for the entire depth of the gridiron. Direction and magnitude of total forces shall be determined from the geometry of the rigging system including load concentrations from spot line rigging. Locking rails shall be designed for a uniform uplift of 500 psf (3447 kN/m<sup>2</sup>) with a 1,000 pound (454 kg) concentration. Impact factor for batten design shall be 75 percent and for loft and head block beams shall be 25 percent. A plan drawn to a scale not less than 1/4 inch (6.4 mm) equals 1 foot (305 mm) shall be displayed in the stage area indicating the framing plan of the rigging loft and the design loads for all members used to support scenery or rigging. Gridirons over stages shall be designed to support a uniformly distributed live load of 50 psf (2.40 kN/m<sup>2</sup>) in addition to the rigging loads indicated.

**1607.3 Uniform live loads.** The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall in no case be less than the minimum uniformly distributed unit loads required by Table 1607.1.

**1607.4 Concentrated loads.** Floors and other similar surfaces shall be designed to support the uniformly distributed live loads prescribed in Section 1607.3 or the concentrated load, in pounds (kilonewtons), given in Table 1607.1, whichever produces the greater load effects. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area 2.5 feet by 2.5 feet (762 mm by 762 mm) and shall be located so as to produce the maximum load effects in the structural members.

**1607.5 Partition loads.** Weights of all partitions shall be considered, using either actual weights at locations shown on the plans or the equivalent uniform load given in Section 1607.5.2. Partition loads shall be taken as superimposed dead loads.

**1607.5.1 Actual loads.** Where actual partition weights are used, the uniform design live load may be omitted from the strip of floor area under each partition.

**1607.5.2 Equivalent uniform load.** The equivalent uniform partition loads in Table 1607.5 may be used in lieu of actual partition weights except for bearing partitions or partitions in toilet room areas (other than in one- and two-family dwellings), at stairs and elevators, and similar areas where partitions are concentrated. In such cases, actual partition weights shall be used in design. Except as otherwise exempted, equivalent uniform partition loads shall be used in areas where partitions are not definitely located on the plans, or in areas where partitions are subject to rearrangement or relocation.

**TABLE 1607.5  
EQUIVALENT UNIFORM PARTITION LOADS**

PARTITION WEIGHT (plf)	EQUIVALENT UNIFORM LOAD (psf) (to be added to floor dead and live loads)
50 or less	0
51 to 100	6
101 to 200	12
201 to 350	20
Greater than 350	20 plus a concentrated live load of the weight in excess of 350 plf.

For SI: 1 pound per linear foot = 0.01459 kN/m<sup>2</sup>,  
1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

**1607.6 Garages.**

**1607.6.1 Passenger vehicle garages.** Areas used for, and restricted by physical limitations of clearance to, the transit or parking of passenger vehicles shall be designed for the uniformly distributed and concentrated loads for parking areas for such vehicles as provided in Table 1607.1 applied without impact. An exception is made for members or constructions which, because of physical limitations, cannot be subjected to direct load from the vehicle or from a jack or hoist used to raise or suspend the vehicle. Such members or constructions shall be designed for the loads corresponding to the actual usage.

**TABLE 1607.6  
UNIFORM AND CONCENTRATED LOADS**

LOADING CLASS <sup>a</sup>	UNIFORM LOAD (pounds/linear foot of lane)	CONCENTRATED LOAD (pounds) <sup>b</sup>	
		For moment design	For shear design
H20-44 and HS20-44	640	18,000	26,000
H15-44 and HS15-44	480	13,500	19,500

For SI: 1 pound per linear foot = 0.01459 kN/m, 1 pound = 0.004448 kN, 1 ton = 8.90 kN.

a. An H loading class designates a two-axle truck with a semitrailer. An HS loading class designates a tractor truck with a semitrailer. The numbers following the letter classification indicate the gross weight in tons of the standard truck and the year the loadings were instituted.

b. See Section 1607.6.1 for the loading of multiple spans.

**1607.6.2 Truck and bus garages.** Minimum live loads for garages having trucks or buses shall be as specified in Table 1607.6, but shall not be less than 50 psf (2.40 kN/m<sup>2</sup>), unless other loads are specifically justified and approved by the commissioner. Actual loads shall be used where they are greater than the loads specified in the table.

**1607.6.2.1 Truck and bus garage live load application.** The concentrated load and uniform load shall be uniformly distributed over a 10-foot (3048 mm) width on a line normal to the centerline of the lane placed within a 12-foot-wide (3658 mm) lane. The loads shall be placed within their individual lanes so as to produce the maximum stress in each structural member. Vertical impact shall be taken as 10 percent of the vertical load. Single spans shall be designed for the uniform

load in Table 1607.6 and one simultaneous concentrated load positioned to produce the maximum effect. Multiple spans shall be designed for the uniform load in Table 1607.6 on the spans and two simultaneous concentrated loads in two spans positioned to produce the maximum negative moment effect. Multiple span design loads, for other effects, shall be the same as for single spans.

**1607.7 Loads on handrails, guards, grab bars, seats and vehicle barrier systems.** Handrails, guards, grab bars, accessible seats, accessible benches and vehicle barrier systems shall be designed and constructed to the structural loading conditions set forth in this section.

**1607.7.1 Handrail assemblies and guards.** Handrail assemblies and guards shall be designed to resist a load of 50 plf (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure. Glass handrail assemblies and guards shall also comply with Section 2407.

**Exceptions:**

1. For one- and two-family dwellings, only the single, concentrated load required by Section 1607.7.1.1 shall be applied.
2. In Group I-3, F, H, and S occupancies, for areas that are not accessible to the general public and that have an occupant load no greater than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

**1607.7.1.1 Concentrated load.** Handrails and guards shall be able to resist a single concentrated load of 200 pounds (0.89 kN), applied in any direction at any point, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.

**1607.7.1.2 Components.** Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area equal to 1 square foot (0.093 m<sup>2</sup>), including openings and space between rails, a vertically downward load of 50 pounds per foot (0.73 kN/m), and a concentrated upward load of 50 pounds (0.22 kN) applied at the most critical location. Reactions due to this loading are not required to be applied simultaneously with one another, and are not required to be superimposed with those of Section 1607.7.1 or 1607.7.1.1. The railings, balusters and components shall be designed separately for the effect of wind when the total wind load on the panel or component exceeds 50 pounds (0.22 kN). The wind load need not be combined with any other live load.

**1607.7.2 Grab bars, shower seats and dressing room bench seats.** Grab bars, shower seats and dressing room bench seat systems shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point.

**1607.7.3 Vehicle barrier systems.** Vehicle barrier systems for passenger vehicles shall be designed to resist a single load of 6,000 pounds (26.70 kN) applied horizontally in any direction to the barrier system and shall have anchorage or attachment capable of transmitting this load to the structure. For design of the system, two loading conditions shall be analyzed. The first condition shall apply the load at a height of 1 foot, 6 inches (457 mm) above the floor or ramp surface. The second loading condition shall apply the load at 2 feet, 3 inches (686 mm) above the floor or ramp surface. The more severe load condition shall govern the design of the barrier restraint system. The load shall be assumed to act on an area not to exceed 1 square foot (0.0929 m<sup>2</sup>), and is not required to be assumed to act concurrently with any handrail or guard loadings specified in Section 1607.7.1. Garages accommodating trucks and buses shall be designed in accordance with a recognized method acceptable to the commissioner that contains provision for traffic railings.

**1607.7.3.1 Columns in parking areas.** Unless specially protected, columns in parking areas subject to impact of moving vehicles shall be designed to resist the lateral load due to impact and this load shall be considered a variable load. For passenger vehicles, this lateral load shall be taken as a minimum of 6,000 pounds (26.70 kN) applied at least 1 foot 6 inches (457 mm); above the roadway, and acting simultaneously with other design loads. In addition, columns in parking areas shall meet the requirements of Section 1615 for structural integrity.

**1607.8 Impact loads.** The live loads specified in Section 1607.3 include allowance for impact conditions. Provisions shall be made in the structural design for uses and loads that involve unusual vibration and impact forces.

**1607.8.1 Elevators.** Elevator loads shall be increased by 100 percent for impact and the structural supports shall be designed within the limits of stress and deflection prescribed by ASME A17.1.

**1607.8.2 Machinery.** For the purpose of design, the weight of machinery and moving loads shall be increased as follows to allow for impact: (1) elevator machinery, 100 percent; (2) light machinery, shaft- or motor-driven, 20 percent; (3) reciprocating machinery or power-driven units, 50 percent; (4) hangers for floors or balconies, 33 percent. Percentages shall be increased where specified by the manufacturer.

**1607.8.3 Railroad equipment.** Minimum loads (including vertical, lateral, longitudinal, and impact) and the distribution thereof shall meet the applicable requirements of Chapter 15 of the *AREMA Manual for Railway Engineering*.

**1607.8.4 Assembly structures.** Seating areas in grandstands, stadiums, and similar assembly structures shall be designed to resist the simultaneous application of a horizontal swaying load of at least 24 plf (36 kg/m) of seats applied in a direction parallel to the row of the seats, and of at least 10 plf (15 kg/m) of seats in a direction perpendicular to the row of the seats. When this load is used in

NYC combination with wind for outdoor structures, the wind  
NYC load shall be one-half of the design wind load.

**1607.9 Reduction in live loads.** Except for uniform live loads at roofs, all other minimum uniformly distributed live loads,  $L_o$ , in Table 1607.1 are permitted to be reduced in accordance with Section 1607.9.1 or 1607.9.2. Roof uniform live loads, other than special purpose roofs of Section 1607.11.2.2, are permitted to be reduced in accordance with Section 1607.11.2. Roof uniform live loads of special purpose roofs are permitted to be reduced in accordance with Section 1607.9.1 or 1607.9.2.

**1607.9.1 General.** Subject to the limitations of Sections 1607.9.1.1 through 1607.9.1.4, members for which a value of  $K_{LL}A_T$  is 400 square feet (37.16 m<sup>2</sup>) or more are permitted to be designed for a reduced live load in accordance with the following equation:

$$L = L_o \left( 0.25 + \frac{15}{\sqrt{K_{LL}A_T}} \right) \quad (\text{Equation 16-29}\ddagger)$$

$$\text{For SI: } L = L_o \left( 0.25 + \frac{4.57}{\sqrt{K_{LL}A_T}} \right)$$

where:

$L$  = Reduced design live load per square foot (square meter) of area supported by the member.

$L_o$  = Unreduced design live load per square foot (square meter) of area supported by the member (see Table 1607.1).

$K_{LL}$  = Live load element factor (see Table 1607.9.1).

$A_T$  = Tributary area, in square feet (square meters).  $L$  shall not be less than  $0.50L_o$  for members supporting one floor and  $L$  shall not be less than  $0.40L_o$  for members supporting two or more floors.

**TABLE 1607.9.1**  
**LIVE LOAD ELEMENT FACTOR,  $K_{LL}$**

ELEMENT	$K_{LL}$
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
All other members not identified above including: Edge beams with cantilever slabs Cantilever beams One-way slabs Two-way slabs Members without provisions for continuous shear transfer normal to their span	1

**1607.9.1.1 One-way slabs.** The tributary area,  $A_T$ , for use in Equation 16-22 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

**1607.9.1.2 Heavy live loads.** Live loads that exceed 100 psf (4.79 kN/m<sup>2</sup>) shall not be reduced.

**Exceptions:**

1. The live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the live load shall not be less than  $L$  as calculated in Section 1607.9.1.
2. For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

**1607.9.1.3 Passenger vehicle garages.** The live loads shall not be reduced in passenger vehicle garages.

**Exception:** The live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent, but the live load shall not be less than  $L$  as calculated in Section 1607.9.1.

**1607.9.1.4 Special occupancies.** Live loads of 100 psf (4.79 kN/m<sup>2</sup>) or less at areas where fixed seats are located shall not be reduced in public assembly occupancies or in areas used for retail or wholesale sales.

**1607.9.1.5 Special structural elements.** Live loads shall not be reduced for one-way slabs except as permitted in Section 1607.9.1.1. Live loads shall not be reduced for calculating shear stresses at the heads of columns in flat slab or flat plate construction.

**1607.9.1.6 Roof members.** Live loads of 100 psf (4.79 kN/m<sup>2</sup>) or less shall not be reduced for roof members except as specified in Section 1607.11.2.

**1607.9.2 Alternate floor live load reduction.** As an alternative to Section 1607.9.1, floor live loads are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. A reduction shall not be permitted in Group A occupancies.
2. A reduction shall not be permitted where the live load exceeds 100 psf (4.79 kN/m<sup>2</sup>) except that the design live load for members supporting two or more floors is permitted to be reduced by 20 percent.

**Exception:** For uses other than storage, where approved, additional live load reductions shall be permitted where shown by the registered design professional that a rational approach has been used and that such reductions are warranted.

3. A reduction shall not be permitted in passenger vehicle parking garages except that the live loads for members supporting two or more floors are permitted to be reduced by a maximum of 20 percent.



4. For live loads not exceeding 100 psf (4.79 kN/m<sup>2</sup>), the design live load for any structural member supporting 150 square feet (13.94 m<sup>2</sup>) or more is permitted to be reduced in accordance with Equation 16-27.

5. For one-way slabs, the area,  $A$ , for use in Equation 16-27 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

$$R = 0.08 (A - 150) \quad (\text{Equation 16-30})$$

For SI:  $R = 0.861(A - 13.94)$

Such reduction shall not exceed the smallest of:

1. 40 percent for horizontal members;
2. 60 percent for vertical members; or
3.  $R$  as determined by the following equation:

$$R = 23.1 (1 + D/L_o) \quad (\text{Equation 16-31})$$

where:

$A$  = Area of floor or roof supported by the member, square feet (m<sup>2</sup>).

$D$  = Dead load per square foot (m<sup>2</sup>) of area supported.

$L_o$  = Unreduced live load per square foot (m<sup>2</sup>) of area supported.

$R$  = Reduction in percent.

**1607.10 Distribution of floor loads.** Where uniform floor live loads are involved in the design of structural members arranged so as to create continuity, the minimum applied loads shall be the full dead loads on all spans in combination with the floor live loads on spans selected to produce the greatest effect at each location under consideration. It shall be permitted to reduce floor live loads in accordance with Section 1607.9.

**1607.11 Roof loads.** The structural supports of roofs and marquees shall be designed to resist wind and, where applicable, snow and earthquake loads, in addition to the dead load of construction and the appropriate live loads as prescribed in this section, or as set forth in Table 1607.1. The live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

**1607.11.1 Distribution of roof loads.** Where uniform roof live loads are reduced to less than 20 psf (0.96 kN/m<sup>2</sup>) in accordance with Section 1607.11.2.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof live loads shall be applied to adjacent spans or to alternate spans, whichever produces the most unfavorable load effect. See Section 1607.11.2 for reductions in minimum roof live loads and Section 7.5 of ASCE 7 for partial snow loading.

**1607.11.1.1 Arches and gabled frames.** The following simplification is permissible:

1. Live load placed on one-half of the span adjacent to one support.
2. Live load placed on the center one-fourth of the span.

3. Live load placed on  $\frac{3}{8}$  of the span adjacent to each support.

**1607.11.2 Reduction in roof live loads.** The minimum uniformly distributed live loads of roofs and marquees,  $L_o$ , in Table 1607.1 are permitted to be reduced in accordance with Section 1607.11.2.1 or 1607.11.2.2.

**1607.11.2.1 Flat, pitched and curved roofs.** Ordinary flat, pitched and curved roofs, and awnings and canopies other than of fabric construction supported by light-weight rigid skeleton structures, are permitted to be designed for a reduced roof live load as specified in the following equations or other controlling combinations of loads in Section 1605, whichever produces the greater load. In structures such as greenhouses, where special scaffolding is used as a work surface for workers and materials during maintenance and repair operations, a lower roof load than specified in the following equations shall not be used unless approved by the commissioner. Such structures shall be designed for a minimum roof live load of 12 psf (0.58 kN/m<sup>2</sup>).

$$L_r = L_o R_1 R_2 \quad (\text{Equation 16-32})$$

where:  $12 \leq L_r \leq 20$

For SI:  $L_r = L_o R_1 R_2$

where:  $0.58 \leq L_r \leq 0.96$

$L_r$  = Reduced live load per square foot (m<sup>2</sup>) of horizontal projection in pounds per square foot (kN/m<sup>2</sup>).

The reduction factors  $R_1$  and  $R_2$  shall be determined as follows:

$$R_1 = 1 \text{ for } A_t \leq 200 \text{ square feet (18.58 m}^2\text{)} \quad (\text{Equation 16-33})$$

$$R_1 = 1.2 - 0.001A_t \text{ for } 200 \text{ square feet} < A_t < 600 \text{ square feet} \quad (\text{Equation 16-34})$$

$$\text{For SI: } 1.2 - 0.011A_t \text{ for } 18.58 \text{ square meters} < A_t < 55.74 \text{ square meters}$$

$$R_1 = 0.6 \text{ for } A_t \geq 600 \text{ square feet (55.74 m}^2\text{)} \quad (\text{Equation 16-35})$$

where:

$A_t$  = Tributary area (span length multiplied by effective width) in square feet (m<sup>2</sup>) supported by any structural member, and

$$R_2 = 1 \text{ for } F \leq 4 \quad (\text{Equation 16-36})$$

$$R_2 = 1.2 - 0.05 F \text{ for } 4 < F < 12 \quad (\text{Equation 16-37})$$

$$R_2 = 0.6 \text{ for } F \geq 12 \quad (\text{Equation 16-38})$$

$F$  = For a sloped roof, the number of inches of rise per foot (for SI:  $F = 0.12 \times \text{slope}$ , with slope expressed as a percentage for an arch or dome, the rise-to-span ratio multiplied by 32)

**1607.11.2.2 Special-purpose roofs.** Roof gardens, marquees, and roofs used for promenade, assembly or other special purposes shall be designed for a minimum live load,  $L_o$ , as specified in Table 1607.1. Such live loads are permitted to be reduced in accordance



with Section 1607.9. Live loads of 100 psf (4.79 kN/m<sup>2</sup>) or more at areas or roofs classified as Group A occupancies shall not be reduced.

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**1607.11.3 Green roofs.** Where roofs utilize a green roof system and are not intended for human occupancy, the uniform design live load in the area covered by the green roof shall be 20 psf (0.958 kN/m<sup>2</sup>). The weight of the landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil. Where roofs utilize a green roof system and are used for human occupancy, the minimum live load shall be as specified in Table 1607.1 or Section 1607.11.2.2, whichever is greater.

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**1607.11.4 Awnings, canopies, and sun control devices.** Awnings, canopies, and sun control devices shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads and wind loads as specified in Sections 1608 and 1609.

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**1607.11.5 Hanging loads.** Girders and roof trusses (other than joists) over garage areas regularly utilized for the repair of vehicles and over manufacturing floors or storage floors used for commercial purposes shall be capable of supporting, in addition to the specified live and wind loads, a concentrated live load of 2,000 pounds (908 kg) applied at any lower chord panel point for trusses, and at any point of the lower flange for girders.

**1607.12 Crane loads.** The crane live load shall be the rated capacity of the crane. Design loads for the runway beams, including connections and support brackets, of moving bridge cranes and monorail cranes shall include the maximum wheel loads of the crane and the vertical impact, lateral and longitudinal forces induced by the moving crane.

**1607.12.1 Maximum wheel load.** The maximum wheel loads shall be the wheel loads produced by the weight of the bridge, as applicable, plus the sum of the rated capacity and the weight of the trolley with the trolley positioned on its runway at the location where the resulting load effect is maximum.

**1607.12.2 Vertical impact force.** The maximum wheel loads of the crane shall be increased by the percentages shown below to determine the induced vertical impact or vibration force:

Monorail cranes (powered) . . . . .	25 percent
Cab-operated or remotely operated bridge cranes (powered) . . . . .	25 percent
Pendant-operated bridge cranes (powered) . . . . .	10 percent
Bridge cranes or monorail cranes with hand-gear bridge, trolley and hoist . . . . .	0 percent

**1607.12.3 Lateral force.** The lateral force on crane runway beams with electrically powered trolleys shall be calculated as 20 percent of the sum of the rated capacity of the crane and the weight of the hoist and trolley. The lateral force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction

perpendicular to the beam, and shall be distributed according to the lateral stiffness of the runway beam and supporting structure.  $F$  = For a sloped roof, the number of inches of rise per foot (for SI:  $F = 0.12 \times \text{slope}$ , with slope expressed as a percentage for an arch or dome, the rise-to-span ratio multiplied by 32

**1607.12.4 Longitudinal force.** The longitudinal force on crane runway beams, except for bridge cranes with hand geared bridges, shall be calculated as 10 percent of the maximum wheel loads of the crane. The longitudinal force shall be assumed to act horizontally at the traction surface of a runway beam, in either direction parallel to the beam.

**1607.13 Interior walls and partitions.** Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m<sup>2</sup>).

**Exception:** Fabric partitions complying with Section 1607.13.1 shall not be required to resist the minimum horizontal load of 5 psf (0.24 kN/m<sup>2</sup>).

**1607.13.1 Fabric partitions.** Fabric partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength to resist the following load conditions:

1. A horizontal distributed load of 5 psf (0.24 kN/m<sup>2</sup>) applied to the partition framing. The total area used to determine the distributed load shall be the area of the fabric face between the framing members to which the fabric is attached. The total distributed load shall be uniformly applied to such framing members in proportion to the length of each member.
2. A concentrated load of 40 pounds (0.176 kN) applied to an 8-inch diameter (203 mm) area of the fabric face at a height of 54 inches [50.3 square inches (32 452 mm<sup>2</sup>)] above the floor.

## SECTION BC 1608 SNOW LOADS

**1608.1 General.** Design snow loads shall be determined in accordance with Chapter 7 of ASCE 7, but the design roof load shall not be less than that determined by Section 1607.

**1608.2 Ground snow loads.** The ground snow load,  $P_g$ , to be used in determining the design snow loads for roofs is 25 psf (1.2 kN/m<sup>2</sup>).

**1608.3 Flat roof snow loads.** The flat roof snow load,  $p_f$ , on a roof with a slope equal to or less than 5 degrees (0.09 rad) (1 inch per foot = 4.76 degrees) shall be calculated in accordance with Section 7.3 of ASCE 7.

**1608.3.1 Exposure factor.** The value for the snow exposure factor,  $C_e$ , used in the calculation of  $p_f$  shall be determined from Table 1608.3.1.

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**TABLE 1608.3.1**  
**SNOW EXPOSURE FACTOR,  $C_e$**

TERRAIN CATEGORY <sup>a</sup>	EXPOSURE OF ROOF <sup>a,b</sup>		
	Fully exposed <sup>c</sup>	Partially exposed	Sheltered
A (see Section 1609.4)	N/A	1.1	1.3
B (see Section 1609.4)	0.9	1.0	1.2
C (see Section 1609.4)	0.9	1.0	1.1

For SI: 1 mile = 1609 m.

- a. The terrain category and roof exposure condition chosen shall be representative of the anticipated conditions during the life of the structure. An exposure factor shall be determined for each roof of a structure.
- b. Definitions of roof exposure are as follows:
1. Fully exposed shall mean roofs exposed on all sides with no shelter afforded by terrain, higher structures or trees. Roofs that contain several large pieces of mechanical equipment, parapets which extend above the height of the balanced snow load,  $h_b$ , or other obstructions are not in this category.
  2. Partially exposed shall include all roofs except those designated as "fully exposed" or "sheltered."
  3. Sheltered roofs shall mean those roofs located tight in among conifers that qualify as "obstructions."
- c. Obstructions within a distance of  $10 h_o$  provide "shelter," where  $h_o$  is the height of the obstruction above the roof level. If the only obstructions are a few deciduous trees that are leafless in winter, the "fully exposed" category shall be used except for terrain category "A." Note that these are heights above the roof. Heights used to establish the terrain category in Section 1609.4 are heights above the ground.

**1608.3.2 Thermal factor.** The value for the thermal factor,  $C_t$ , used in the calculation of  $p_f$  shall be determined from Table 1608.3.2.

**TABLE 1608.3.2**  
**THERMAL FACTOR,  $C_t$**

THERMAL CONDITION <sup>a</sup>	$C_t$
All structures except as indicated below	1.0
Structures kept just above freezing and others with cold, ventilated roofs in which the thermal resistance ( $R$ -value) between the ventilated space and the heated space exceeds $25 \text{ h} \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}$	1.1
Unheated structures	1.2
Continuously heated greenhouses <sup>b</sup> with a roof having a thermal resistance ( $R$ -value) less than $2.0 \text{ h} \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu}$	0.85

For SI:  $1 \text{ h} \cdot \text{ft}^2 \cdot ^\circ\text{F}/\text{Btu} = 0.176 \text{ m}^2 \cdot \text{K}/\text{W}$ .

- a. The thermal condition shall be representative of the anticipated conditions during winters for the life of the structure.
- b. A continuously heated greenhouse shall mean a greenhouse with a constantly maintained interior temperature of  $50^\circ\text{F}$  or more during winter months. Such greenhouse shall also have a maintenance attendant on duty at all times or a temperature alarm system to provide warning in the event of a heating system failure.

**1608.3.3 Snow load importance factor.** The value for the snow load importance factor,  $I_s$ , used in the calculation of  $p_f$  shall be determined in accordance with Table 1604.5.2 based on the Structural Occupancy Category determined in accordance with Table 1604.5. Greenhouses that are occupied for growing plants on production or research basis, without public access, shall be included in Structural Occupancy Category I.

**1608.3.4 Reserved.**

**1608.3.5 Ponding instability.** For roofs with a slope less than  $1/4$  inch per foot (1.19 degrees), the design calculations shall include verification of the prevention of ponding instability in accordance with Section 7.11 of ASCE 7.

**1608.3.6 Ice.** For ice loads to be used in the design of ice sensitive structures, such as open framed or guyed towers, refer to Chapter 10 of ASCE 7.

**1608.4 Sloped roof snow loads.** The snow load,  $p_s$ , on a roof with a slope greater than 5 degrees (0.09 rad) (1 inch per foot = 4.76 degrees) shall be calculated in accordance with Section 7.4 of ASCE 7.

**1608.5 Partial loading.** The effect of not having the balanced snow load over the entire loaded roof area shall be analyzed in accordance with Section 7.5 of ASCE 7.

**1608.6 Unbalanced snow loads.** Unbalanced roof snow loads shall be determined in accordance with Section 7.6 of ASCE 7. Winds from all directions shall be accounted for when establishing unbalanced snow loads.

**1608.7 Drifts on lower roofs.** In areas where the ground snow load,  $P_g$ , as determined by Section 1608.2, is equal to or greater than 5 psf (0.240 kN/m<sup>2</sup>), roofs shall be designed to sustain localized loads from snowdrifts in accordance with Section 7.7 of ASCE 7.

**1608.8 Roof projections.** Drift loads due to mechanical equipment, penthouses, parapets and other projections above the roof shall be determined in accordance with Section 7.8 of ASCE 7.

**1608.9 Sliding snow.** The extra load caused by snow sliding off a sloped roof onto a lower roof shall be determined in accordance with Section 7.9 of ASCE 7.

## SECTION BC 1609 WIND LOADS

**1609.1 Applications.** Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

**1609.1.1 Determination of wind loads.** Wind loads on every building or structure shall be determined in accordance with Chapter 6 of ASCE 7, with the basic wind speed and the exposure category determined in accordance with Sections 1609.3 through 1609.4. Wind loads may also be determined using provisions of the alternate methods described in Section 1609.6. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

### Exceptions:

1. Reserved.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of the AF&PA WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of AISI S230.

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**1609.1.5 Wind and seismic detailing.** Lateral-force-resisting systems shall meet seismic detailing requirements and limitations prescribed in this code, even when wind code prescribed load effects are greater than seismic load effects.

**1609.2 Definitions.** The following words and terms shall, for the purposes of Section 1609, have the meanings shown herein.

**BUILDINGS AND OTHER STRUCTURES, FLEXIBLE.** Buildings and other structures that have a fundamental natural frequency less than 1 Hz.

**BUILDING, ENCLOSED.** A building that does not comply with the requirements for open or partially enclosed buildings.

**BUILDING, LOW-RISE.** Enclosed or partially enclosed buildings that comply with the following conditions:

1. Mean roof height,  $h$ , less than or equal to 60 feet (18 288 mm).
2. Mean roof height,  $h$ , does not exceed least horizontal dimension.

**BUILDING, OPEN.** A building having each wall at least 80 percent open. This condition is expressed for each wall by the equation:

$$A_o \geq 0.8A_g \quad (\text{Equation 16-39})$$

where:

$A_o$  = Total area of openings in a wall that receives positive external pressure, in square feet ( $\text{m}^2$ ).

$A_g$  = The gross area of that wall in which  $A_o$  is identified, in square feet ( $\text{m}^2$ ).

**BUILDING, PARTIALLY ENCLOSED.** A building that complies with both of the following conditions:

1. The total area of openings in a wall that receives positive external pressure exceeds the sum of the areas of openings in the balance of the building envelope (walls and roof) by more than 10 percent; and
2. The total area of openings in a wall that receives positive external pressure exceeds 4 square feet ( $0.37 \text{ m}^2$ ) or 1 percent of the area of that wall, whichever is smaller, and the percentage of openings in the balance of the building envelope does not exceed 20 percent. These conditions are expressed by the following equations:

$$A_o > 1.10A_{oi} \quad (\text{Equation 16-40})$$

$$A_o > 4 \text{ square feet } (0.37 \text{ m}^2) \text{ or } > 0.01A_g, \text{ whichever is smaller, and } A_{oi}/A_{gi} \leq 0.20 \quad (\text{Equation 16-41})$$

where:

$A_o, A_g$  are as defined for an open building.

$A_{oi}$  = The sum of the areas of openings in the building envelope (walls and roof) not including  $A_o$ , in square feet ( $\text{m}^2$ ).

$A_{gi}$  = The sum of the gross surface areas of the building envelope (walls and roof) not including  $A_g$ , in square feet ( $\text{m}^2$ ).

**BUILDING, SIMPLE DIAPHRAGM.** A building in which wind loads are transmitted through floor and roof diaphragms to the vertical lateral-force-resisting systems.

**COMPONENTS AND CLADDING.** Elements of the building envelope that do not qualify as part of the main wind force-resisting system.

**EAVE HEIGHT,  $h$ .** The distance from the ground surface adjacent to the building to the roof eave line at the particular wall. If the distance of the eave varies along the wall, the average distance shall be used.

**EFFECTIVE WIND AREA.** The area used to determine  $G C_p$ . For component and cladding elements, the effective wind area in Tables 1609.6.2.1(2) and 1609.6.2.1(3) is the span length multiplied by an effective width that need not be less than one-third the span length. For cladding fasteners, the effective wind area shall not be greater than the area that is tributary to an individual fastener.

**HURRICANE-PRONE REGIONS.** New York City is within the hurricane-prone region.

**IMPORTANCE FACTOR,  $I$ .** A factor that accounts for the degree of hazard to human life and damage to property.

**MAIN WIND FORCE-RESISTING SYSTEM.** An assemblage of structural elements assigned to provide support and stability for the overall structure. The system generally receives wind loading from more than one surface.

**MEAN ROOF HEIGHT.** The average of the roof eave height and the height to the highest point on the roof surface, except that eave height shall be used for roof angle of less than or equal to 10 degrees ( $0.1745 \text{ rad}$ ).

**WIND-BORNE DEBRIS REGION.** New York City is not in the wind-borne debris region.

**1609.3 Basic wind speed.** The basic wind speed for New York City is 98 mph ( $43.8 \text{ m/s}$ ). The basic wind speed is measured at 33 feet ( $10 \text{ 058 mm}$ ) above ground in Exposure C as a 3-second gust speed. This wind speed is based on local wind climate with a nominal annual probability of 0.02 [nominal 50-year mean recurrence interval which is obtained by dividing the 700 year mean recurrence wind speed by  $\sqrt{1.6}$ ].‡

**1609.3.1 Wind speed conversion.** When required, the 3-second gust wind speed,  $V_{3s}$ , can be converted to a fastest-mile wind speed,  $V_{fm}$ , using Equation 16-42 below.

$$V_{fm} = (V_{3s} - 10.5) / 1.05 \quad (\text{Equation 16-42})$$

**1609.4 Exposure category.** For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply.

Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. When applying the simplified wind load method of Section 1609.6, a single exposure category shall be used based upon the most restrictive for any given wind direction.



**1609.4.1 Wind directions and sectors.** For each selected wind direction at which the wind loads are to be evaluated, the exposure of the building or structure shall be determined for the two upwind sectors extending 45 degrees (0.79 rad) either side of the selected wind direction. The exposures in these two sectors shall be determined in accordance with Sections 1609.4.2 and 1609.4.3 and the exposure resulting in the highest wind loads shall be used to represent winds from that direction.

**1609.4.2 Surface roughness categories.** A ground surface roughness within each 45-degree (0.79 rad) sector shall be determined for a distance upwind of the site as defined in Section 1609.4.3 from the categories defined below, for the purpose of assigning an exposure category as defined in Section 1609.4.3.

**Surface Roughness B.** Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

**Surface Roughness C.** Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, grasslands, and limited water surfaces per Figure 1609.4.3.

**Surface Roughness D.** Flat, unobstructed areas and water surfaces, including areas in hurricane-prone regions. This category includes smooth mud flats, salt flats and unbroken ice.

**1609.4.3 Exposure categories.** An exposure category shall be determined in accordance with the following:

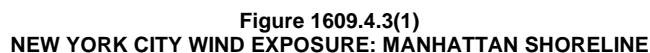
Figure 1609.4.3 provides the exposure categories at the shore lines for wind directions approaching over the water within the city boundaries.

**Exposure B.** Exposure B shall apply where the ground surface roughness condition, as defined by Surface Roughness B, prevails in the upwind direction for a distance of at least 2,600 feet (792 m) or 20 times the height of the building, whichever is greater.

**Exception:** For buildings whose mean roof height is less than or equal to 30 feet (9144 mm), the upwind distance is permitted to be reduced to 1,500 feet (457 m).

**Exposure C.** Exposure C shall apply where it is shown in Figure 1609.4.3 or for all cases where Exposures B or D does not apply.

**Exposure D.** Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance of at least 5,000 feet (1524 m) or 20 times the height of the building, whichever is greater. Exposure D shall extend inland from the shoreline for a distance of 600 feet (183 m) or 20 times the height of the building, whichever is greater.



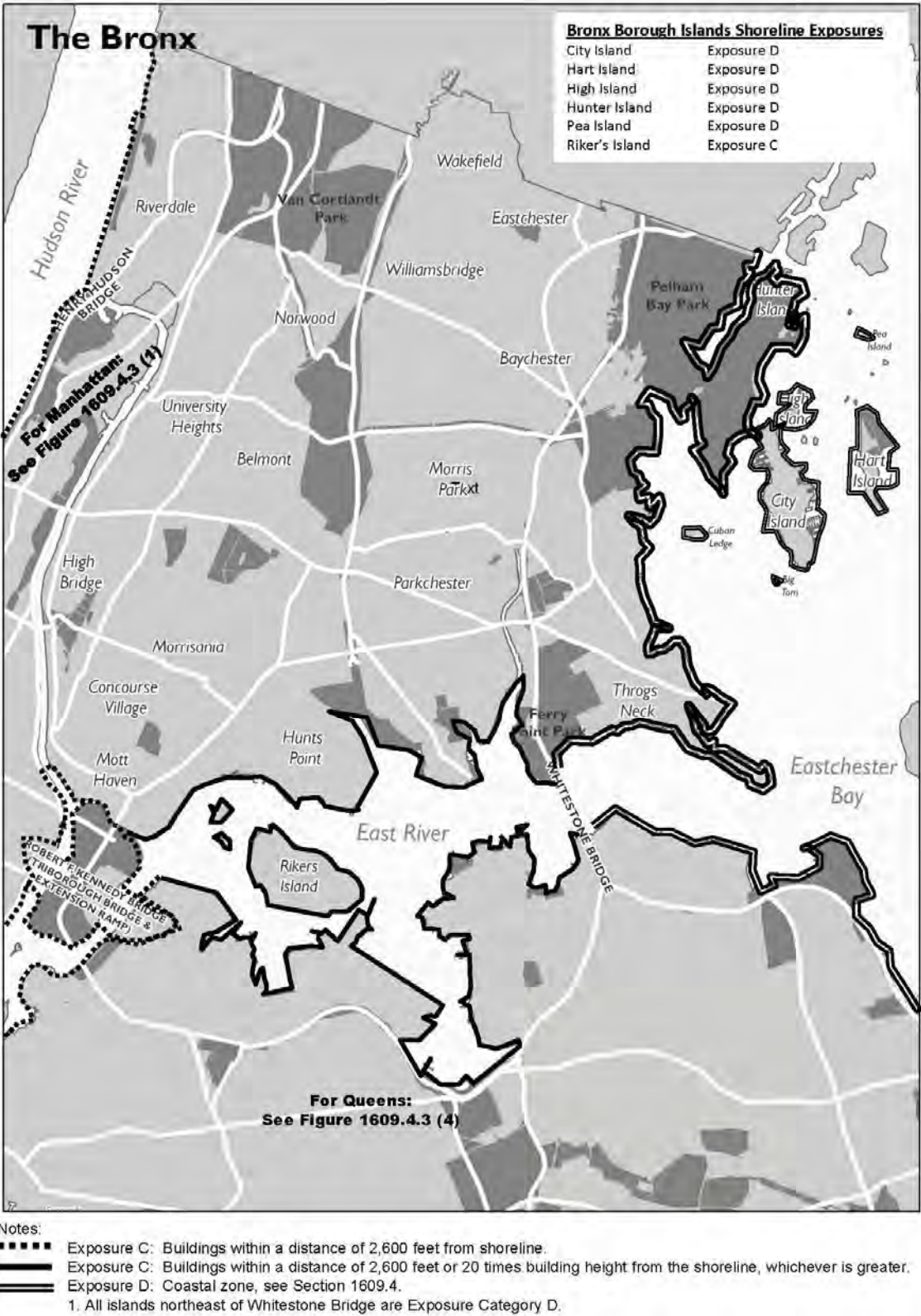
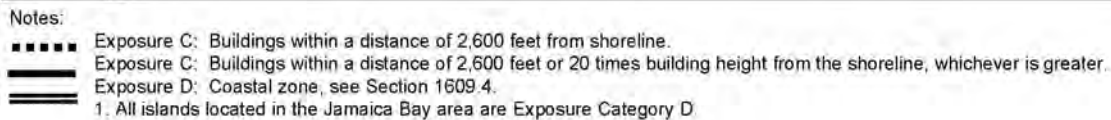


FIGURE 1609.4.3(2)  
NEW YORK CITY WIND EXPOSURE: BRONX SHORELINE









**FIGURE 1609.4.3(4)**



**1609.5 Importance factor.** Buildings and other structures shall be assigned a wind load importance factor,  $I$ , in accordance with Table 1604.5.2 based on the Structural Occupancy Category determined by Table 1604.5.

#### 1609.6 Simplified wind load methods.

**1609.6.1 Scope.** The procedures in Section 1609.6 shall be permitted to be used for determining and applying wind pressures in the design of enclosed buildings as listed below:

1. For buildings with flat, gabled or hipped roofs having a mean roof height not exceeding the least horizontal dimension or 60 feet (18 288 mm), whichever is less, the use of Section 1609.6.2, Simplified Procedure I, is permitted.
2. For buildings located within any Borough with a mean roof height of not more than 200 feet (60 960 mm) not located in Exposure C or D in accordance with Section 1609.4, the use of Section 1609.6.3, Simplified Procedure II, is permitted.
3. For buildings located within the Borough of Manhattan with a mean roof height of not more than 300 feet (91 440 mm) and not located in Exposure C or D in accordance with Section 1609.4, the use of Section 1609.6.3, Simplified Procedure II, is permitted.

#### 1609.6.2 Simplified Design Procedure I (for low-rise buildings).

1. The wind shall be assumed to come from any horizontal direction.

2. An importance factor  $I$  shall be determined in accordance with Section 1609.5.

3. An exposure category shall be determined in accordance with Section 1609.4.

4. A height and exposure adjustment coefficient,  $\lambda$ , shall be determined from Table 1609.6.2.1(4).

**1609.6.2.1 Main wind force-resisting system.** Simplified design wind pressures,  $p_s$ , for the main wind force-resisting systems represent the net pressures (sum of internal and external) to be applied to the horizontal and vertical projections of building surfaces as shown in Figure 1609.6.2.1. For the horizontal pressures (Zones A, B, C, D),  $p_s$  is the combination of the windward and leeward net pressures.  $p_s$  shall be determined from Equation 16-43).

$$p_s = \lambda I P_{s30} \quad (\text{Equation 16-43})$$

where:

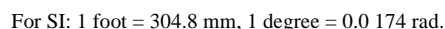
$\lambda$  = Adjustments factor for building height and exposure from Table 1609.6.2.1(4).

$I$  = Importance factor as defined in Section 1609.5.

$P_{s30}$  = Simplified design wind pressure for Exposure B, at  $h = 30$  feet (9144 mm), and for  $I = 1.0$ , from Table 1609.6.2.1(1).

**1609.6.2.1.1 Minimum pressures.** The load effects of the design wind pressures from Section 1609.6.2.1 shall not be less than assuming the pressures,  $p_s$ , for Zones A, B, C and D all equal to + 20 psf (0.96 kN/m<sup>2</sup>), while assuming Zones E, F, G, and H all equal to 0 psf.





**Notes:**

1. Pressures are applied to the horizontal and vertical projections for Exposure B, at  $h = 30$  feet, for  $I = 1.0$ . Adjust to other exposures and heights with adjustment factor  $\lambda$ .
2. The load patterns shown shall be applied to each corner of the building in turn as the reference corner.
3. For the design of the longitudinal MWFRS, use  $\theta = 0^\circ$ , and locate the Zone E/F, G/H boundary at the mid-length of the building.
4. Load Cases 1 and 2 must be checked for  $25^\circ < \theta \leq 45^\circ$ . Load Case 2 at  $25^\circ$  is provided only for interpolation between  $25^\circ$  to  $30^\circ$ .
5. Plus and minus signs signify pressures acting toward and away from the projected surfaces, respectively.
6. For roof slopes other than those shown, linear interpolation is permitted.
7. The total horizontal load shall not be less than that determined by assuming  $P_s = 0$  in Zones B and D.
8. The zone pressures represent the following:
  - Horizontal pressure zones — Sum of the windward and leeward net (sum of internal and external) pressures on vertical projection of:
 

A – End zone of wall	E – End zone of windward roof
B – End zone of roof	F – End zone of leeward roof
C – Interior zone of wall	G – Interior zone of windward roof
D – Interior zone of roof	H – Interior zone of leeward roof
  - Vertical pressure zones — Net (sum of internal and external) pressures on horizontal projection of:
9. Where Zone E or G falls on a roof overhang on the windward side of the building, use  $E_{OH}$  and  $G_{OH}$  for the pressure on the horizontal projection of the overhang. Overhangs on the leeward and side edges shall have the basic zone pressure applied.
10. Notation:
  - $a$ : 10 percent of least horizontal dimension or  $0.4h$ , whichever is smaller, but not less than either 4 percent of least horizontal dimension or 3 feet.
  - $h$ : Mean roof height, in feet (meters), except that eave height shall be used for roof angles  $< 10^\circ$ .
  - $\theta$ : Angle of plane of roof from horizontal, in degrees.



**TABLE 1609.6.2.1(1)**  
**SIMPLIFIED DESIGN WIND PRESSURE (MAIN WINDFORCE-RESISTING SYSTEM),  $p_{s30}$  (Exposure B at  $h = 30$  feet with  $I = 1.0$ ) (psf)**

ROOF ANGLE (degrees)	ROOF RISE IN 12	LOAD CASE	ZONES									
			Horizontal Pressures				Vertical Pressures				Overhangs	
			A	B	C	D	E	F	G	H	$E_{OH}$	$G_{OH}$
0 to 5°	Flat	1	12.0	-6.0	8.0	-4.0	-14.0	-8.0	-10.0	-6.0	-20.0	-15.0
10°	2	1	22.0	-9.0	15.0	-5.0	-23.0	-14.0	-16.0	-11.0	-33.0	-26.0
15°	3	1	24.0	-8.0	16.0	-5.0	-23.0	-15.0	16.0	-12.0	-33.0	-26.0
20°	4	1	27.0	-7.0	18.0	-4.0	-23.0	-16.0	16.0	-12.0	-33.0	-26.0
25°	6	1	24.0	4.0	18.0	4.0	-11.0	-15.0	-8.0	-12.0	-20.0	-17.0
		2	—	—	—	—	-4.0	-8.0	-1.0	-5.0	—	—
30° to 45°	7 to 12	1	22.0	15.0	17.0	12.0	2.0	-13.0	1.0	-12.0	-8.0	-9.0
		2	22.0	15.0	17.0	12.0	9.0	-7.0	7.0	-5.0	-4.0	-9.0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 degree = 0.0174 rad, 1 mile per hour = 0.44 m/s, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**TABLE 1609.6.2.1(2)**  
**NET DESIGN WIND PRESSURE (COMPONENT AND CLADDING),  $p_{net30}$**   
**(Exposure B at  $h = 30$  feet with  $I = 1.0$  and  $kzt = 1$  and 98 mph 3 sec. gust basic wind speed) (psf)**

	ZONE	EFFECTIVE WIND AREA	PRESSURE/ SUCTION	
Roof 0 to 7 degrees	1	10	7.0	-17.0
	1	20	7.0	-16.0
	1	50	6.0	-16.0
	1	100	6.0	-15.0
	2	10	7.0	-28.0
	2	20	7.0	-25.0
	2	50	6.0	-21.0
	2	100	6.0	-18.0
	3	10	7.0	-42.0
	3	20	7.0	-35.0
	3	50	6.0	-26.0
	3	100	6.0	-18.0
Roof > 7 to 27 degrees	1	10	10.0	-15.0
	1	20	9.0	-15.0
	1	50	8.0	-14.0
	1	100	7.0	-14.0
	2	10	10.0	-27.0
	2	20	9.0	-25.0
	2	50	8.0	-22.0
	2	100	7.0	-20.0
	3	10	10.0	-39.0
	3	20	9.0	-37.0
	3	50	8.0	-33.0
	3	100	7.0	-31.0

Roof > 27 to 45 degrees	1	10	15.0	-17.0
	1	20	15.0	-16.0
	1	50	14.0	-15.0
	1	100	14.0	-14.0
	2	10	15.0	-20.0
	2	20	15.0	-19.0
	2	50	14.0	-18.0
	2	100	14.0	-17.0
	3	10	15.0	-20.0
	3	20	15.0	-19.0
	3	50	14.0	-18.0
	3	100	14.0	-17.0
Wall	4	10	17.0	-18.0
	4	20	16.0	-18.0
	4	50	15.0	-17.0
	4	100	14.0	-16.0
	4	500	13.0	-14.0
	5	10	17.0	-22.0
	5	20	16.0	-21.0
	5	50	15.0	-19.0
	5	100	14.0	-18.0
	5	500	13.0	-14.0

For SI: 1 foot = 304.8 mm, 1 degree = 0.0174 rad,  
1 mile per hour = 0.44 m/s, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**Note:** For effective areas between those given above, the load is permitted to be interpolated, otherwise use the load associated with the lower effective area.

**TABLE 1609.6.2.1(3)**  
**ROOF OVERHANG NET DESIGN WIND PRESSURE**  
**(COMPONENT AND CLADDING),  $p_{net30}$**   
**(Exposure B at  $h = 30$  feet with  $I_w = 1.0$  and 98 mph 3 sec. gust**  
**basic wind speed) (psf)**

	ZONE	EFFECTIVE WIND AREA (sq. ft.)	PRESSURE/ SUCTION
Roof 0 to 7 degrees	2	10	-24.0
	2	20	-24.0
	2	50	-23.0
	2	100	-23.0
	3	10	-40.0
	3	20	-31.0
	3	50	-20.0
	3	100	-12.0
Roof > 7 to 27 degrees	2	10	-31.0
	2	20	-31.0
	2	50	-31.0
	2	100	-31.0
	3	10	-52.0
	3	20	-47.0
	3	50	-41.0
	3	100	-35.0
Roof > 27 to 45 degrees	2	10	-28.0
	2	20	-28.0
	2	50	-26.0
	2	100	-26.0
	3	10	-28.0
	3	20	-28.0
	3	50	-26.0
	3	100	-26.0

For SI: 1 foot = 304.8 mm, 1 degree = 0.0174 rad,  
 1 mile per hour = 0.45 m/s, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**Note:** For effective areas between those given above, the load is permitted to be interpolated, otherwise use the load associated with the lower effective area.

**TABLE 1609.6.2.1(4)**  
**ADJUSTMENT FACTOR FOR BUILDING HEIGHT AND EXPOSURE,**  
**( $\lambda$ )**

MEAN ROOF HEIGHT	EXPOSURE		
(feet)	B	C/C1	D
15	1.00	1.21	1.47
20	1.00	1.29	1.55
25	1.00	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.09	1.49	1.74
45	1.12	1.53	1.78
50	1.16	1.56	1.81
55	1.19	1.59	1.84
60	1.22	1.62	1.87

For SI: 1 foot = 304.8 mm.

a. All table values shall be adjusted for other exposures and heights by multiplying by the above coefficients.

**1609.6.2.2 Components and cladding.** Net design wind pressures,  $p_{net}$ , for the components and cladding of buildings represent the net pressures (sum of internal and external) to be applied normal to each building surface as shown in Figure 1609.6.2.2. The net design wind pressure,  $p_{net}$ , shall be determined from Equation 16-44:

$$p_{net} = \lambda I p_{net30} \quad \text{(Equation 16-44)}$$

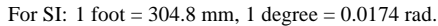
where:

$\lambda$  = Adjustments factor for building height and exposure from Table 1609.6.2.1(4).

$I$  = Importance factor as defined in Section 1609.5.

$p_{net30}$  = Net design wind pressure for Exposure B, at  $h = 30$  feet (9144 mm), and for  $I_w = 1.0$ , from Tables 1609.6.2.1(2) and 1609.6.2.1(3).

**1609.6.2.2.1 Minimum pressures.** The positive design wind pressures,  $p_{net}$ , from Section 1609.6.2.2 shall not be less than + 20 psf (1.44 kN/m<sup>2</sup>), and the negative design wind pressures,  $p_{net}$ , from Section 1609.6.2.2 shall not be less than - 20 psf (-1.44 kN/m<sup>2</sup>).



1. Pressures are applied normal to the surface for Exposure B, at  $h = 30$  feet, for  $I_w = 1.0$ . Adjust to other exposures and heights with adjustment factor  $\lambda$ .
2. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
3. For hip roofs with  $\theta \leq 25^\circ$ , Zone 3 shall be treated as Zone 2.
4. For effective areas between those given, the value is permitted to be interpolated, otherwise use the value associated with the lower effective area.
5. Notation:
  - $a$ : 10 percent of least horizontal dimension or  $0.4h$ , whichever is smaller, but not less than either 4 percent of least horizontal dimension or 3 feet.
  - $h$ : Mean roof height, in feet (meters), except that eave height shall be used for roof angles  $< 10^\circ$ .
  - $\theta$ : Angle of plane of roof from horizontal, in degrees.

**1609.6.2.3 Load case.** Members that act as both part of the main wind force-resisting system and as components and cladding shall be designed for each separate load case.

**1609.6.3.1 Main wind-force-resisting system.** Main wind force-resisting systems shall comply with the following:

- |   |                          |
|---|--------------------------|
| 1.1. From 0 to 100 feet (0 to 30 480 mm) elevation 20 psf (0.96 kN/m <sup>2</sup> ).  | NYC<br>NYC<br>NYC        |
| 1.2. From 100 to 300 feet (30 480 to 91 440 mm) elevation 25 psf (1.2 kN/m <sup>2</sup> ).  | NYC<br>NYC<br>NYC<br>NYC |
| An importance factor, <i>I</i> , shall be determined in accordance with Section 1609.5 and shall be applied to the pressures indicated above. | NYC<br>NYC<br>NYC<br>NYC |

**1609.6.3.2 Design wind load cases.** The main wind-force-resisting system of buildings, whose wind loads have been determined pursuant to Section 1609.6.3,

shall be designed for wind load cases as defined below:

**Case 1.** Full design wind pressure acting on the projected area perpendicular to each principal axis of the structure, considered separately along each principal axis.

**Case 2.** Seventy-five percent of the design wind pressure acting on the projected area perpendicular to each principal axis of the structure to be applied eccentric to the center of the exposure with eccentricity equal to 15 percent of the exposure width, considered separately for each principal direction.

**Case 3.** Wind loading as defined in Case 1 for each orthogonal direction, but considered to act simultaneously at 75 percent of the specified value.

**1609.6.3.3 Components and cladding.** Net design wind positive and negative pressures (pressure and suction) for the components and cladding of buildings represent the net pressures (sum of internal and external) to be applied normal to each building surface. The net design wind positive and negative pressures shall not be less than 30 psf (1.44 kN/m<sup>2</sup>), except at the corners of the building with a width equivalent to 10 percent of the building's width at its side, the net design wind negative pressure for the components and cladding shall not be less than: (i) 45 psf (2.16 kN/m<sup>2</sup>) for the portion of the building between 200 feet (60.76 meters) to 300 feet (91.14 meters) height above ground and (ii) 40 psf (1.92 kN/m<sup>2</sup>) for the portion of the building between 100 feet (30.38 meters) to 199 feet (60.66 meters) in height above ground.

**1609.6.3.4 Roof.** The design pressure and suction acting over the entire roof including purlins, roofing, and other roof elements (including their fastenings) shall not be less than 30 psf (1.44 kN/m<sup>2</sup>).

**1609.6.3.5 Other building elements.** The following building elements of buildings whose wind loads have been determined under the provisions of Section 1609.6.3 shall be designed for wind pressures shown in Section 1609.6.3.1 multiplied by the following shape factors given in Table 1609.6.3.5.

**TABLE 1609.6.3.5  
OTHER BUILDING ELEMENTS**

CONSTRUCTION SHAPE FACTOR	
Signs (and their supports), or portions thereof, having 70 percent or more of solid surface	1.5
Signs (and their supports), or portions thereof, having less than 70 percent of solid surface	2.0
Tanks, cooling towers, and similar constructions	1.5
Square and rectangular chimneys	1.5

**1609.6.3.5.1 Eaves and cornices.** Eaves, cornices, and overhanging elements of the buildings shall be designed for upward pressures twice the values given in Section 1609.6.3.1.

## 1609.7 Roof systems.

**1609.7.1 Roof deck.** The roof deck shall be designed to withstand the wind pressures determined under either the provisions of Section 1609.6 for buildings satisfying the height and other requirements of the simplified methods or Section 1609.1.1 for buildings of any height.

**1609.7.2 Roof coverings.** Roof coverings shall comply with the requirements for roof decks pursuant to Section 1609.7.1.

### Exceptions:

1. Rigid tile roof coverings that are air permeable and installed over a roof deck complying with Section 1609.7.1 are permitted to be designed in accordance with Section 1609.7.3.
2. Asphalt shingles installed over a roof deck complying with Section 1609.7.1 shall comply with the wind-resistance requirements of Section 1507.2.7.1.

**1609.7.3 Rigid tile.** Wind loads on rigid tile roof coverings shall be determined in accordance with the following equation:

$$M_a = q_h C_L b L L_a (1.0 - G C_p) \quad (\text{Equation 16-45})$$

$$\text{For SI: } M_a = q_h C_L b L L_a (1.0 - G C_p) / 1,000$$

where:

$b$  = Exposed width, feet (mm) of the roof tile.

$C_L$  = Lift coefficient. The lift coefficient for concrete and clay tile shall be 0.2 or shall be determined by test in accordance with Section 1716.2.

$G C_p$  = Roof pressure coefficient for each applicable roof zone determined from Chapter 6 of ASCE 7. Roof coefficients shall not be adjusted for internal pressure.

$L$  = Length, feet (mm) of the roof tile.

$L_a$  = Moment arm, feet (mm) from the axis of rotation to the point of uplift on the roof tile. The point of uplift shall be taken at 0.76L from the head of the tile and the middle of the exposed width. For roof tiles with nails or screws (with or without a tail clip), the axis of rotation shall be taken as the head of the tile for direct deck application or as the top edge of the batten for battened applications. For roof tiles fastened only by a nail or screw along the side of the tile, the axis of rotation shall be determined by testing. For roof tiles installed with battens and fastened only by a clip near the tail of the tile, the moment arm shall be determined about the top edge of the batten with consideration given for the point of rotation of the tiles based on straight bond or broken bond and the tile profile.

$M_a$  = Aerodynamic uplift moment, feet-pounds (N-mm) acting to raise the tail of the tile.

$q_h$  = Wind velocity pressure, psf (kN/m<sup>2</sup>) determined from Section 6.5.10 of ASCE 7.



Concrete and clay roof tiles complying with the following limitations shall be designed to withstand the aerodynamic uplift moment as determined by this section.‡

1. The roof tiles shall be either loose laid on battens, mechanically fastened, mortar set or adhesive set.‡
2. The roof tiles shall be installed on solid sheathing which has been designed as components and cladding.‡
3. An underlayment shall be installed in accordance with Chapter 15.‡
4. The tile shall be single lapped interlocking with a minimum head lap of not less than 2 inches (51 mm).‡
5. The length of the tile shall be between 1.0 and 1.75 feet (305 and 533 mm).‡
6. The exposed width of the tile shall be between 0.67 and 1.25 feet (204 mm and 381 mm).‡
7. The maximum thickness of the tail of the tile shall not exceed 1.3 inches (33 mm).‡
8. Roof tiles using mortar set or adhesive set systems shall have at least two-thirds of the tile's area free of mortar or adhesive contact.‡

**1609.8 Wind on temporary structures.** Wind on temporary structures shall be permitted to be designed for reduced wind loading in accordance with the requirements of Section 1618.

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## SECTION BC 1610 SOIL LATERAL LOAD

**1610.1 General.** Foundation walls and retaining walls shall be designed to resist lateral soil and hydrostatic loads. The soil loads specified in Table 1610.1 shall be used as the minimum design lateral soil loads unless specified otherwise in a geotechnical investigation report prepared in accordance with Section 1802. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Retaining walls free to move and rotate at the top are permitted to be designed for active pressure. Design lateral pressure from hydrostatic, dynamic, or surcharge loads shall be added to the lateral earth pressure load, as applicable. For hydrostatic lateral pressure, see Section 1806.2. Design lateral pressure shall be increased if soils at the site are expansive.

**Exception:** Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible diaphragms shall be permitted to be designed for active pressure.

**TABLE 1610.1  
SOIL LATERAL LOAD**

DESCRIPTION OF BACKFILL MATERIAL <sup>c</sup>	UNIFIED SOIL CLASSIFICATION	DESIGN LATERAL SOIL LOAD <sup>a</sup> (pound per square foot per foot of depth)	
		Active pressure	At-rest pressure
Well-graded, clean gravels; gravel-sand mixes	GW	30	60
Poorly graded clean gravels; gravel-sand mixes	GP	30	60
Silty gravels, poorly graded gravel-sand mixes	GM	40	60
Clayey gravels, poorly graded gravel-and-clay mixes	GC	45	60
Well-graded, clean sands; gravelly sand mixes	SW	30	60
Poorly graded clean sands; sand-gravel mixes	SP	30	60
Silty sands, poorly graded sand-silt mixes	SM	45	60
Sand-silt clay mix with plastic fines	SM-SC	45	100
Clayey sands, poorly graded sand-clay mixes	SC	60	100
Inorganic silts and clayey silts	ML	45	100
Mixture of inorganic silt and clay	ML-CL	60	100
Inorganic clays of low to medium plasticity	CL	60	100
Organic silts and silt clays, low plasticity	OL	Note b	Note b
Inorganic clayey silts, elastic silts	MH	Note b	Note b
Inorganic clays of high plasticity	CH	Note b	Note b
Organic clays and silty clays	OH	Note b	Note b

For SI: 1 pound per square foot per foot of depth = 0.157 kPa/m, 1 foot = 304.8 mm.

- Design lateral soil loads are given for moist conditions for the specified soils at their optimum densities. Actual field conditions shall govern. Submerged or saturated soil pressures shall include the weight of the buoyant soil plus the hydrostatic loads.
- Unsuitable as backfill material.
- The definition and classification of soil materials shall be in accordance with ASTM D 2487.

## SECTION BC 1611 RAIN LOADS

**1611.1 Design rain loads.** Each portion of a roof shall be designed to sustain the load of rainwater that will accumulate on it if the primary drainage system for that portion is blocked plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow.

$$R = 5.2 (d_s + d_h) \quad (\text{Equation 16-46})$$

For SI:  $R = 0.0098 (d_s + d_h)$

where:

$d_h$  = Additional depth of water on the undeflected roof above the inlet of secondary drainage system at its design flow (i.e., the hydraulic head), in inches (mm).

$d_s$  = Depth of water on the undeflected roof up to the inlet of secondary drainage system when the primary drainage system is blocked (i.e., the static head), in inches (mm).

$R$  = Rain load on the undeflected roof, in psf (kN/m<sup>2</sup>). When the phrase "undeflected roof" is used, deflections from loads (including dead loads) shall not be considered when determining the amount of rain on the roof.

⇒ **1611.2 Ponding instability.** For roofs with a slope less than  $\frac{1}{4}$  inch per foot [1.19 degrees (0.0208 rad)], the design calculations shall include verification of adequate stiffness to preclude progressive deflection in accordance with Section 8.4 of ASCE 7.

**1611.3 Controlled drainage.** Roofs equipped with hardware to control the rate of drainage shall be equipped with a secondary drainage system at a higher elevation that limits accumulation of water on the roof above that elevation. Such roofs shall be designed to sustain the load of rainwater that will accumulate on them to the elevation of the secondary drainage system plus the uniform load caused by water that rises above the inlet of the secondary drainage system at its design flow determined from Section 1611.1. Such roofs shall also be checked for ponding instability in accordance with Section 1611.2.

## SECTION BC 1612 FLOOD LOADS

**1612.1 General.** The requirements for flood loads shall be as specified in Appendix G of this code.

⇒ **1612.2 Reserved.**

**1612.3 Reserved.**

**1612.4 Reserved.**

**1612.5 Reserved.**

## SECTION BC 1613 EARTHQUAKE LOADS

**1613.1 Scope.** Every structure, and portion thereof, including nonstructural components that are permanently attached to

structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7-10, excluding Chapter 14 and Appendix 11A. The seismic design category for a structure shall be determined in accordance with either Section 1613 or ASCE 7-10.

### Exceptions:

1. One- and two-family dwellings three stories or less in height.
2. The seismic-force-resisting system of wood-frame buildings that conform to the provisions of Section 2308.
3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7-10 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.

**1613.1.1 Seismic importance factor.** The value for the seismic load importance factor,  $I$ , used in the calculation of  $E$  shall be determined in accordance with Table 1604.5.2 based on the Risk Category determined in accordance with Table 1604.5.

**1613.2† Definitions.** The following words and terms shall, for the purposes of this section, have the meanings shown herein.

**DESIGN EARTHQUAKE GROUND MOTION.‡** The earthquake ground motion that buildings and structures are specifically proportioned to resist in Section 1613.

**MAXIMUM CONSIDERED EARTHQUAKE (MCE) GROUND MOTION‡.** The most severe earthquake effects considered by this standard more specifically defined in the following two terms.

**MAXIMUM CONSIDERED EARTHQUAKE GEOMETRIC MEAN (MCE<sub>G</sub>) PEAK GROUND ACCELERATIONS.** The most severe earthquake effects considered by this standard determined for geometric mean peak ground acceleration and without adjustment for targeted risk. The MCE<sub>G</sub> peak ground acceleration adjusted for site effects (PGA<sub>M</sub>) is used in this standard for evaluation of liquefaction, lateral spreading, seismic settlements, and other soil-related issues. The PGA<sub>M</sub> values adjusted for site effects are provided in Table 1813.2.1 or can be derived from the site-specific procedures provided in Section 21.5 of ASCE 7-10.

**RISK-TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCE<sub>R</sub>) GROUND MOTION RESPONSE ACCELERATIONS.** The most severe earthquake effects considered by this standard determined for the orientation that results in the largest maximum response for horizontal ground motions and with adjustment for targeted risk. The MCE<sub>R</sub> Ground Motion values can be determined from general procedure in Section 1613.5.3 or can be derived

from the site specific procedures provided in Sections 21.1 and 21.2 of ASCE 7-10.

**MECHANICAL SYSTEMS.** For the purposes of determining seismic loads in ASCE 7-10, mechanical systems shall also include fire protection, plumbing and fuel gas systems as specified therein.

**ORTHOGONAL.** To be in two horizontal directions, at 90 degrees (1.57 rad) to each other.

**SEISMIC DESIGN CATEGORY.** A classification assigned to a structure based on its risk category and the severity of the design earthquake ground motion at the site.

**SEISMIC-FORCE-RESISTING SYSTEM.** The part of the structural system that has been considered in the design to provide the required resistance to the prescribed seismic forces.

**SITE CLASS.** A classification assigned to a site based on the types of soils present and their engineering properties as defined in Section 1613.5.2.

**SITE COEFFICIENTS.** The values of,  $F_a$ , and,  $F_v$ , indicated in Tables 1613.5.3(1) and 1613.5.3(2), respectively.

**1613.3 Reserved.**

**1613.4 Reserved.**

**1613.5 Seismic ground motion values.** Seismic ground motion values shall be determined in accordance with this section.

**1613.5.1 Mapped acceleration parameters.** The mapped maximum considered earthquake spectral response acceleration at short periods ( $S_s$ ) shall be 0.281 g and at 1-second period ( $S_l$ ) shall be 0.073 g. The mapped long-period transition period ( $T_l$ ) shall be 6 seconds.

**1613.5.2 Site class definitions.** Based on the site soil properties, the site shall be classified as either Site Class A, B, C, D, E or F in accordance with Table 1613.5.2. Where the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless the commissioner or geotechnical data determines that Site Class E or F soil is present at the site.

**1613.5.3 Site coefficients and risk-targeted maximum considered earthquake ( $MCE_R$ ) spectral response acceleration parameters.** The  $MCE_R$  spectral response acceleration parameters for short periods,  $S_{MS}$ , and at 1-second period,  $S_{MI}$ , adjusted for site class effects shall be determined by Equations 16-47 and 16-48, respectively:‡

$$S_{MS} = F_a S_s \quad \text{(Equation 16-47)‡}$$

$$S_{MI} = F_v S_l \quad \text{(Equation 16-48)‡}$$

where:‡

$F_a$  = Site coefficient defined in Table 1613.5.3(1).‡

$F_v$  = Site coefficient defined in Table 1613.5.3(2).‡

$S_s$  = The mapped  $MCE_R$  spectral accelerations for short periods as determined in Section 1613.5.1.‡

$S_l$  = The mapped  $MCE_R$  spectral accelerations for a 1-second period as determined in Section 1613.5.1.‡

**TABLE 1613.5.2  
SITE CLASS DEFINITIONS**

SITE CLASS	SOIL PROFILE NAME	AVERAGE PROPERTIES IN TOP 100 feet, AS PER SECTION 1615.1.5		
		Soil shear wave velocity, $\bar{v}_s$ , (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$ , (psf)
<b>A</b>	Hard rock	$\bar{v}_s > 5,000$	N/A	N/A
<b>B</b>	Rock	$2,500 < \bar{v}_s \leq 5,000$	N/A	N/A
<b>C</b>	Very dense soil and soft rock	$1,200 < \bar{v}_s \leq 2,500$	$\bar{N} > 50$	$\bar{s}_u \geq 2,000$
<b>D</b>	Stiff soil profile	$600 \leq \bar{v}_s \leq 1,200$	$15 \leq \bar{N} \leq 50$	$1,000 \leq \bar{s}_u \leq 2,000$
<b>E</b>	Stiff soil profile	$\bar{v}_s < 600$	$\bar{N} < 15$	$\bar{s}_u < 1,000$
<b>E</b>	—	Any profile with more than 10 feet of soil having the following characteristics: 1. Plasticity index $PI > 20$ , 2. Moisture content $w \geq 40\%$ , and 3. Undrained shear strength $< 500$ psf.		
<b>F</b>	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ( $H > 10$ feet of peat and/or highly organic clay where $H$ = thickness of soil). 3. Very high plasticity clays ( $H > 25$ feet with plasticity index $PI > 75$ ). 4. Very thick soft/medium stiff clays ( $H > 120$ feet).		

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>, 1 pound per square foot = 0.0479 kPa. N/A = Not applicable.

**TABLE 1613.5.3(1)**  
**VALUES OF SITE COEFFICIENT,  $F_a$ , AS A FUNCTION OF SITE CLASS AND MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS ( $S_s$ )<sup>a</sup>**

SITE CLASS	$F_a$
A	0.80
B	1.00
C	1.20
D	1.57
E	2.37
F	Note a

a. Site-specific geotechnical investigation and dynamic site response analyses shall be performed to determine appropriate values, except that for structures with periods of vibration equal or less than 0.5 second, values of  $F_a$  for liquefiable soils are permitted to be taken equal to the values for the site class determined without regard to liquefaction in Section 1613.5.5.

**TABLE 1613.5.3(2)**  
**VALUES OF SITE COEFFICIENT,  $F_v$ , AS A FUNCTION OF SITE CLASS AND MAPPED SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD ( $S_1$ )<sup>a</sup>**

SITE CLASS	$F_v$
A	0.80
B	1.00
C	1.70
D	2.40
E	3.50
F	Note a

a. Site-specific geotechnical investigation and dynamic site response analyses shall be performed to determine appropriate values, except that for structures with periods of vibration equal or less than 0.5 second, values of  $F_v$  for liquefiable soils are permitted to be taken equal to the values for the site class determined without regard to liquefaction in Section 1613.5.5.

**1613.5.4 Design spectral response acceleration parameters.** Five-percent damped design spectral response acceleration at short periods,  $S_{DS}$ , and at 1-second period,  $S_{D1}$ , shall be determined from Equations 16-49 and 16-50, respectively:

$$S_{DS} = 2/3 S_{MS} \quad \text{(Equation 16-49)}$$

$$S_{D1} = 2/3 S_{M1} \quad \text{(Equation 16-50)}$$

where:

$S_{MS}$  = The  $MCE_R$  spectral response accelerations for short period as determined in Section 1613.5.3.

$S_{M1}$  = The  $MCE_R$  spectral response accelerations for 1-second period as determined in Section 1613.5.3.

**1613.5.5 Site classification for seismic design.** Site classification for Site Class C, D or E shall be determined from Table 1613.5.5. The notations presented below apply to only materials encountered above rock meeting Class 1a, 1b, or 1c as defined in Section 1804 or rock with shear

wave velocity greater than 2,500 feet per second (762 m/s) to a maximum depth of 100 feet (30 480 mm). Profiles containing distinctly different soil and rock layers shall be subdivided into those layers designated by a number that ranges from 1 to  $n$  at the bottom where there is a total of  $n$  distinct layers in the upper 100 feet (30 480 mm). The symbol  $i$  then refers to any one of the layers between 1 and  $n$ .

where:

$v_{si}$  = The shear wave velocity in feet per second (m/s).

$d_i$  = The thickness of any layer between 0 and 100 feet (30 480 mm).

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}} \quad \text{(Equation 16-51)}$$

$$\sum_{i=1}^n d_i = 100 \text{ feet (30 480 mm)}$$

where:

$N_i$  is the Standard Penetration Resistance (ASTM D1586) not to exceed 100 blows/foot (328 blows/m) as directly measured in the field without corrections. When refusal is met for a rock layer of Class 1d,  $N_i$  shall be less than or equal to 100 blows/foot (328 blows/m) provided that the extent of the Class 1c or better rock is determined, not to exceed 100 feet. Alternatively, if this boring is not performed, site classification should be based on all soil material that is above the Class 1d layer.

$$\bar{N} = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{N_i}} \quad \text{(Equation 16-52)}$$

$$\bar{N}_{ch} = \frac{d_s}{\sum_{i=1}^m \frac{d_i}{N_i}} \quad \text{(Equation 16-53)}$$

where:

$$\sum_{i=1}^m d_i = d_s$$



Use  $d_i$  and  $N_i$  for cohesionless soil layers only in Equation 16-42. ‡

$d_s$  = The total thickness of cohesionless soil layers in the top 100 feet (30 480 mm). ‡

$m$  = The number of cohesionless soil layers in the top 100 feet (30 480 mm). ‡

$S_{ui}$  = The undrained shear strength in psf (kPa), not to exceed 5,000 psf (240 kPa), ASTM D 2166 or D 2850. ‡

$$\bar{S}_u = \frac{d_c}{\sum_{i=1}^k \frac{d_i}{S_{ui}}}$$

where: ‡

$$\sum_{i=1}^k d_i = d_c$$

$d_c$  = The total thickness (100 -  $d_s$ ) (For SI: 30480 -  $d_s$ ) of cohesive soil layers in the top 100 feet (30 480 mm). ‡

$k$  = The number of cohesive soil layers in the top 100 feet (30 480 mm). ‡

$PI$  = The plasticity index, ASTM D 4318. ‡

$w$  = The moisture content in percent, ASTM D 2216. ‡

Where a site does not qualify under the criteria for Site Class F and there is a total thickness of soft clay greater than 10 feet (3048 mm) where a soft clay layer is defined by  $\bar{s}_u < 500$  psf (24 kPa),  $w > 40$  percent, and  $PI > 20$ , it shall be classified as Site Class E. The shear wave velocity for rock, Site Class B, shall be either measured on site or estimated by a geotechnical engineer or engineering geologist/seismologist for competent rock with moderate fracturing and weathering. Softer and more highly fractured and weathered rock shall either be measured on site for shear wave velocity or classified as Site Class C. The hard rock category, Site Class A, shall be supported by shear wave velocity measurements either on site or on profiles of the same rock type in the same formation with an equal or greater degree of weathering and fracturing. Where hard rock conditions are known to be continuous to a depth of 100 feet (30 480 mm), surficial shear wave velocity measurements are permitted to be extrapolated to assess  $v_s$ . The rock categories, Site Classes A and B, shall not be used if there is more than 10 feet (3048 mm) of soil between the rock surface and the bottom of the spread footing or mat foundation. ‡

#### 1613.5.5.1 Steps for classifying a site.

1. Check for the four categories of Site Class F requiring site-specific evaluation. If the site corresponds to any of these categories, classify the site as Site Class F and conduct a site-specific

evaluation according to ASCE 7-10 and the requirements of Section 1813.

2. Check for the existence of a total thickness of soft clay  $> 10$  feet (3048 mm) where a soft clay layer is defined by:  $\bar{s}_u < 500$  psf (24 kPa),  $w \geq 40$  percent and  $PI > 20$ . If these criteria are satisfied, classify the site as Site Class E.
3. Categorize the site using one of the following three methods with  $\bar{v}_s$ ,  $\bar{N}$ , and  $\bar{s}_u$  and computed in all cases as specified.
  - 3.1.  $\bar{v}_s$  for the top 100 feet (30 480 mm) ( $\bar{v}_s$  method).
  - 3.2.  $\bar{N}$  for the top 100 feet (30 480 mm) ( $\bar{N}$  method).
  - 3.3.  $\bar{N}_{ch}$  for cohesionless soil layers ( $PI < 20$ ) in the top 100 feet (30 480 mm) and average,  $\bar{s}_u$ , for cohesive soil layers ( $PI > 20$ ) in the top 100 feet (30 480 mm) ( $\bar{s}_u$  method).

**TABLE 1613.5.5  
SITE CLASSIFICATION<sup>a</sup>**

SITE CLASS	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
E	$< 600$ ft/s	$< 15$	$< 1,000$ psf
D	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
C	1,200 to 2,500 ft/s	$> 50$	$> 2,000$

For SI: 1 foot per second = 304.8 mm per second,

1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. If the method is used and the criteria differ, select the category with the softer soils (for example, use Site Class E instead of D).

**1613.5.6 Determination of seismic design category.** All structures shall be assigned to a seismic design category based on their risk category determined in accordance with Table 1604.5 and the design spectral response acceleration parameters  $S_{DS}$  and  $S_{DI}$ , determined in accordance with Section 1613.5.4 or the site-specific procedures of ASCE 7-10. Each building and structure shall be assigned to the more severe seismic design category in accordance with Table 1613.5.6(1) or 1613.5.6(2), irrespective of the fundamental period of vibration of the structure,  $T$ .

**TABLE 1613.5.6(1)  
SEISMIC DESIGN CATEGORY BASED ON  
SHORT-PERIOD (0.2 SECOND) RESPONSE ACCELERATIONS**

VALUE OF $S_{DS}$	RISK CATEGORY <sup>a</sup>		
	I & II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g < S_{DS} < 0.33g$	B	B	C
$0.33g < S_{DS} < 0.50g$	C	C	D
$0.50g < S_{DS}$	D <sup>a</sup>	D <sup>a</sup>	D <sup>a</sup>

- a. Requirements for Seismic Design Categories E and F have been eliminated from the *New York City Building Code* as such categories do not apply in New York City. References to these Seismic Design Categories can be found in ASCE 7-10.

**TABLE 1613.5.6(2)**  
**SEISMIC DESIGN CATEGORY BASED ON**  
**1-SECOND PERIOD RESPONSE ACCELERATION**

VALUE OF $S_{DI}$	RISK CATEGORY <sup>a</sup>		
	I & II	III	IV
$S_{DI} < 0.067g$	A	A	A
$0.067g < S_{DI} < 0.133g$	B	B	C
$0.133g < S_{DI} < 0.20g$	C	C	D
$0.20g \leq S_{DI}$	D <sup>a</sup>	D <sup>a</sup>	D <sup>a</sup>

a. Requirements for Seismic Design Categories E and F have been eliminated from the *New York City Building Code* as such categories do not apply in New York City. References to these Seismic Design Categories can be found in ASCE 7-10.

**1613.5.6.1 Alternative seismic design category determination.** The seismic design category is permitted to be determined from Table 1613.5.6(1) alone when all of the following apply:

1. In each of the two orthogonal directions, the approximate fundamental period of the structure,  $T_a$ , as determined in accordance with Section 12.8.2.1 of ASCE 7-10, is less than  $0.8 T_s$ , as determined in accordance with Section 11.4.5 of ASCE 7-10.
2. In each of the two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than  $T_s$ .
3. Equation 12.8-2 of ASCE 7-10 is used to determine the seismic response coefficient,  $C_s$ .
4. The diaphragms are rigid, as defined in Section 12.3.1 of ASCE 7-10 or, for diaphragms that are flexible, the distances between the vertical elements of the seismic-force-resisting system do not exceed 40 feet (12 192 mm).

**1613.5.6.2 Simplified design procedure.** Where the alternate simplified design procedure of ASCE 7-10 is used, the seismic design category shall be determined in accordance with ASCE 7-10.

**1613.6 Alternatives to ASCE 7-10.** The provisions of Section 1613.6 shall be permitted as alternatives to the relevant provisions of ASCE 7-10.

**1613.6.1 Additional seismic-force-resisting systems for seismically isolated structures.** Add the following exception to the end of Section 17.5.4.2 of ASCE 7-10:

**Exception:** For isolated structures designed in accordance with this standard, the Structural System Limitations and the Structural Height Limits in Table 1613.8 for ordinary steel concentrically braced frames (OCBFs) as defined in Chapter 11 of ASCE 7-10 and ordinary moment frames (OMFs) as defined in Chapter 11 of ASCE 7-10 are permitted to be taken as 160 feet (48 768 mm) for structures assigned to Seismic Design Category D, provided that the following conditions are satisfied:

1. The value of  $R_f$  as defined in Chapter 17 of ASCE 7-10 is taken as 1.

2. For OMFs and OCBFs, design is in accordance with AISC 341.

**1613.7 Structural separations.** All structures shall be separated from adjacent structures. When a structure adjoins a property line not common to a public way (typically side or rear lot lines), that structure shall also be set back from the property line by at least 1 inch (25 mm) for each 50 feet (15 240 mm) of height and a minimum of 1 inch (25 mm) for structures with heights less than 50 feet (15 240 mm). For structures in Seismic Design Category D, refer to ASCE 7-10 for additional requirements.

**Exception:** Smaller separations or property line setbacks shall be permitted when justified by rational analysis based on maximum expected ground motions with a minimum separation of 1 inch (25 mm) along the full height of the structure.

**1613.7.1 Masonry structures.** For structures adjacent to existing unreinforced masonry bearing wall structures, the structural separation shall be filled with a material with a minimum compressive strength of 25 psi (172.37 kPa) and a maximum compressive strength of 100 psi (689.74 kPa). Additionally, when the adjacent wall is a party wall, the party wall shall be made secure by the party responsible for the new construction as per Chapter 33.

**1613.7.2 Covers.** The infill material shall be covered on all sides and shall meet the appropriate provisions of Chapter 26. The covering must be of adequate strength to resist the wind loads for cladding as specified in Chapter 16 and shall conform to all applicable provisions in Chapter 14.

**1613.7.3 Covers wider than 5 inches (127 mm).** When a building separation wider than 5 inches (127 mm) is created pursuant to Section 1613.7, such separation, at the roof level of the proposed new building, or at the roof level of an existing adjoining building where if that building is lower than the proposed new building, shall have a horizontal cover/closure that conforms with the following:

1. The cover/closure material shall be noncombustible; and

**Exception:** The cover/closure material used shall be permitted to be combustible material in accordance with Section 1509.9 if all the material on the appropriate roof conforms to the limitations therein, there are no masonry openings in either wall abutting the building separation, and both buildings are noncombustible.

2. The cover/closure shall be capable of withstanding the roof live load of 30 psf (1.43 kPa), securely fastened to the new building, and be of a type that would be capable of preventing unauthorized or accidental access to the space.

**1613.8 ASCE 7-10, Table 12.2-1.** Modify ASCE 7-10, Table 12.2-1 as follows:

**TABLE 1613.8**  
**DESIGN COEFFICIENT AND FACTORS FOR BASIC SEISMIC C-FORCE-RESISTING SYSTEMS**

					STRUCTURAL SYSTEM LIMITATIONS INCLUDING STRUCTURAL HEIGHT, $H_n$ (FT), LIMITS <sup>c</sup>		
Seismic Force-Resisting System	ASCE 7-10 Section Where Detailing Requirements Are Specified	Response Modification Coefficient	Overstrength Factor	Deflection Amplification Factor	Seismic Design Category		
<b>A. BEARING WALL SYSTEMS</b>		<b>R<sup>a</sup></b>	<b><math>\Omega_0^g</math></b>	<b><math>C_d^b</math></b>	<b>B</b>	<b>C</b>	<b>D<sup>d</sup></b>
1. Special reinforced concrete shear walls <sup>1,m</sup>	14.2	5	2.5	5	NL	NL	NL
2. Ordinary reinforced concrete shear walls <sup>1</sup>	14.2	4	2.5	4	NL	NL	NP
3. Detailed plain concrete shear walls <sup>1</sup>	14.2	2	2.5	2	NL	NP	NP
4. Ordinary plain concrete shear walls <sup>1</sup>	14.2	1.5	2.5	1.5	NL	NP	NP
5. Intermediate precast shear walls <sup>1</sup>	14.2	4	2.5	4	NL	NL	40 <sup>k</sup>
6. Ordinary precast shear walls <sup>1</sup>	14.2	3	2.5	3	NL	NP	NP
7. Special reinforced masonry shear walls	14.4	5	2.5	3.5	NL	NL	NL
8. Intermediate reinforced masonry shear walls	14.4	3.5	2.5	2.25	NL	NL	NP
9. Ordinary reinforced masonry shear walls	14.4	2	2.5	1.75	NL	NL	NP
10. Detailed plain masonry shear walls	14.4	2	2.5	1.75	NL	NP	NP
11. Ordinary plain masonry shear walls	14.4	1.5	2.5	1.25	NL	NP	NP
12. Prestressed masonry shear walls	14.4	1.5	2.5	1.75	NL	NP	NP
13. Ordinary reinforced Autoclaved Aerated Concrete (AAC) masonry shear walls	14.4	2	2.5	2	NL	35	NP
14. Ordinary plain (unreinforced) Autoclaved Aerated Concrete (AAC) masonry shear walls	14.4	1.5	2.5	1.5	NL	NP	NP
15. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1 and 14.5	6.5	3	4	NL	NL	65
16. Light-frame (cold-formed steel) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1	6.5	3	4	NL	NL	65
17. Light-frame walls with shear panels of all other materials	14.1 and 14.5	2	2.5	2	NL	NL	35
18. Light-frame (cold-formed steel) wall systems using flat strap bracing	14.1	4	2	3.5	NL	NL	65
<b>B. BUILDING FRAME SYSTEMS</b>		<b>R<sup>a</sup></b>	<b><math>\Omega_0^g</math></b>	<b><math>C_d^b</math></b>	<b>B</b>	<b>C</b>	<b>D<sup>d</sup></b>
1. Steel eccentrically braced frames	14.1	8	2	4	NL	NL	NL
2. Steel special concentrically braced frames	14.1	6	2	5	NL	NL	NL
3. Steel ordinary concentrically braced frames	14.1	3.25	2	3.25	NL	NL	35 <sup>j</sup>
4. Special reinforced concrete shear walls <sup>1,m</sup>	14.2	6	2.5	5	NL	NL	NL
5. Ordinary reinforced concrete shear walls <sup>1</sup>	14.2	5	2.5	4.5	NL	NL	NP
6. Detailed plain concrete shear walls <sup>1</sup>	14.2 and 14.2.2.8	2	2.5	2	NL	NP	NP
7. Ordinary plain concrete shear walls <sup>1</sup>	14.2	1.5	2.5	1.5	NL	NP	NP
8. Intermediate precast shear walls <sup>1</sup>	14.2	5	2.5	4.5	NL	NL	40 <sup>k</sup>
9. Ordinary precast shear walls <sup>1</sup>	14.2	4	2.5	4	NL	NP	NP
10. Steel and concrete composite eccentrically braced frames	14.3	8	2	4	NL	NL	NL
11. Steel and concrete composite special concentrically braced frames	14.3	5	2	4.5	NL	NL	NL
12. Steel and concrete composite ordinary braced frames	14.3	3	2	3	NL	NL	NP
13. Steel and concrete composite plate shear walls	14.3	6.5	2.5	5.5	NL	NL	NL
14. Steel and concrete composite special shear walls	14.3	6	2.5	5	NL	NL	NL
15. Steel and concrete composite ordinary shear walls	14.3	5	2.5	4.5	NL	NL	NP

(continued)

**TABLE 1613.8—continued**

**DESIGN COEFFICIENT AND FACTORS FOR BASIC SEISMIC C-FORCE-RESISTING SYSTEMS**

SEISMIC RESISTING SYSTEMS					STRUCTURAL SYSTEM LIMITATIONS INCLUDING STRUCTURAL HEIGHT, H <sub>n</sub> (FT), LIMITS <sup>c</sup>		
Seismic Force-Resisting System	ASCE 7-10 Section Where Detailing Requirements Are Specified	Response Modification Coefficient	Overstrength Factor	Deflection Amplification Factor	Seismic Design Category		
16. Special reinforced masonry shear walls	14.4	5.5	2.5	4	NL	NL	NL
17. Intermediate reinforced masonry shear walls	14.4	4	2.5	4	NL	NL	NP
18. Ordinary reinforced masonry shear walls	14.4	2	2.5	2	NL	NL	NP
19. Detailed plain masonry shear walls	14.4	2	2.5	2	NL	NP	NP
20. Ordinary plain masonry shear walls	14.4	1.5	2.5	1.25	NL	NP	NP
21. Prestressed masonry shear walls	14.4	1.5	2.5	1.75	NL	NP	NP
22. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance	14.5	7	2.5	4.5	NL	NL	65
23. Light-frame (cold-formed steel) walls sheathed with wood structural panels rated for shear resistance or steel sheets	14.1	7	2.5	4.5	NL	NL	65
24. Light-frame walls with shear panels of all other materials	14.1 and 14.5	2.5	2.5	2.5	NL	NL	35
25. Steel buckling-restrained braced frames	14.1	8	2.5	5	NL	NL	NL
26. Steel special plate shear walls	14.1	7	2	6	NL	NL	NL
C. MOMENT-RESISTING FRAME SYSTEMS		R <sup>a</sup>	Ω <sub>0</sub> <sup>g</sup>	C <sub>d</sub> <sup>b</sup>	B	C	D <sup>d</sup>
1. Steel special moment frames	14.1 and 12.2.5.5	8	3	5.5	NL	NL	NL
2. Steel special truss moment frames	14.1	7	3	5.5	NL	NL	NL
3. Steel intermediate moment frames	14.1 and 12.2.5.7	4.5	3	4	NL	NL	35 <sup>h</sup>
4. Steel ordinary steel moment frames	14.1 and 12.2.5.6	3.5	3	3	NL	NL	NP <sup>i</sup>
5. Special reinforced concrete moment frames <sup>n</sup>	14.2 and 12.2.5.5	8	3	5.5	NL	NL	NL
6. Intermediate reinforced concrete moment frames	14.2	5	3	4.5	NL	NL	NP
7. Ordinary reinforced concrete moment frames	14.2	3	3	2.5	NL	NP	NP
8. Steel and concrete composite special moment frames	14.3 and 12.2.5.5	8	3	5.5	NL	NL	NL
9. Steel and concrete composite intermediate moment frames	14.3	5	3	4.5	NL	NL	NP
10. Steel and concrete composite partially restrained moment frames	14.3	6	3	5.5	NL	NL	100
11. Steel and concrete composite ordinary moment frames	14.3	3	3	2.5	NL	NP	NP
12. Cold-formed steel—special bolted moment frame <sup>p</sup>	14.1	3.5	3 <sup>o</sup>	3.5	35	35	35
D. DUAL SYSTEMS WITH SPECIAL MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES	12.2.5.1	R <sup>a</sup>	Ω <sub>0</sub> <sup>g</sup>	C <sub>d</sub> <sup>b</sup>	B	C	D <sup>d</sup>
1. Steel eccentrically braced frames	14.1	8	2.5	4	NL	NL	NL
2. Steel special concentrically braced frames	14.1	7	2.5	5.5	NL	NL	NL
3. Special reinforced concrete shear walls <sup>1</sup>	14.2	7	2.5	5.5	NL	NL	NL
4. Ordinary reinforced concrete shear walls <sup>1</sup>	14.2	6	2.5	5	NL	NL	NP
5. Steel and concrete composite eccentrically braced frames	14.3	8	2.5	4	NL	NL	NL
6. Steel and concrete composite special concentrically braced frames	14.3	6	2.5	5	NL	NL	NL
7. Steel and concrete composite plate shear walls	14.3	7.5	2.5	6	NL	NL	NL
8. Steel and concrete composite special shear walls	14.3	7	2.5	6	NL	NL	NL

(continued)



**TABLE 1613.8—continued**  
**DESIGN COEFFICIENT AND FACTORS FOR BASIC SEISMIC C-FORCE-RESISTING SYSTEMS**

					STRUCTURAL SYSTEM LIMITATIONS INCLUDING STRUCTURAL HEIGHT, $H_n$ (FT), LIMITS <sup>c</sup>		
Seismic Force-Resisting System	ASCE 7-10 Section Where Detailing Requirements Are Specified	Response Modification Coefficient	Overstrength Factor	Deflection Amplification Factor	Seismic Design Category		
9. Steel and concrete composite ordinary shear walls	14.3	6	2.5	5	NL	NL	NP
10. Special reinforced masonry shear walls	14.4	5.5	3	5	NL	NL	NL
11. Intermediate reinforced masonry shear walls	14.4	4	3	3.5	NL	NL	NP
12. Steel buckling-restrained braced frames	14.1	8	2.5	5	NL	NL	NL
13. Steel special plate shear walls	14.1	8	2.5	6.5	NL	NL	NL
<b>E. DUAL SYSTEMS WITH INTERMEDIATE MOMENT FRAMES CAPABLE OF RESISTING AT LEAST 25% OF PRESCRIBED SEISMIC FORCES</b>	<b>12.2.5.1</b>	<b>R<sup>a</sup></b>	<b><math>\Omega_0^g</math></b>	<b><math>C_d^b</math></b>	<b>B</b>	<b>C</b>	<b>D<sup>d</sup></b>
1. Steel special concentrically braced frames <sup>f</sup>	14.1	6	2.5	5	NL	NL	35
2. Special reinforced concrete shear walls <sup>1</sup>	14.2	6.5	2.5	5	NL	NL	NL
3. Ordinary reinforced masonry shear walls	14.4	3	3	2.5	NL	NL	NP
4. Intermediate reinforced masonry shear walls	14.4	3.5	3	3	NL	NL	NP
5. Steel and concrete composite special concentrically braced frames	14.3	5.5	2.5	4.5	NL	NL	NL
6. Steel and concrete composite ordinary braced frames	14.3	3.5	2.5	3	NL	NL	NP
7. Steel and concrete composite ordinary shear walls	14.3	5	3	4.5	NL	NL	NP
8. Ordinary reinforced concrete shear walls <sup>1</sup>	14.2	5.5	2.5	4.5	NL	NL	NP
<b>F. SHEAR WALL-FRAME INTERACTIVE SYSTEM WITH ORDINARY REINFORCED CONCRETE MOMENT FRAMES AND ORDINARY REINFORCED CONCRETE SHEAR WALLS<sup>1</sup></b>	<b>14.2 and 12.2.5.8</b>	<b>4.5</b>	<b>2.5</b>	<b>4</b>	<b>NL</b>	<b>NP</b>	<b>NP</b>
<b>G. CANTILEVERED COLUMN SYSTEMS DETAILED TO CONFORM TO THE REQUIREMENTS FOR:</b>	<b>12.2.5.2</b>	<b>R<sup>a</sup></b>	<b><math>\Omega_0^g</math></b>	<b><math>C_d^b</math></b>	<b>B</b>	<b>C</b>	<b>D<sup>d</sup></b>
1. Steel special cantilever column systems	14.1	2.5	1.25	2.5	35	35	35
2. Steel ordinary cantilever column systems	14.1	1.25	1.25	1.25	35	35	NP <sup>i</sup>
3. Special reinforced concrete moment frames <sup>n</sup>	14.2 and 12.2.5.5	2.5	1.25	2.5	35	35	35
4. Intermediate reinforced concrete moment frames	14.2	1.5	1.25	1.5	35	35	NP
5. Ordinary reinforced concrete moment frames	14.2	1	1.25	1	35	NP	NP
6. Timber frames	14.5	1.5	1.5	1.5	35	35	35
<b>H. STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE, EXCLUDING CANTILEVER COLUMN SYSTEMS</b>	<b>14.1</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>NL</b>	<b>NL</b>	<b>NP</b>

a. Response modification coefficient,  $R$ , for use throughout the standard. Note  $R$  reduces forces to a strength level, not an allowable stress level.

b. Deflection amplification factor,  $C_d$ , for use in Sections 12.8.6, 12.8.7, and 12.9.2 of ASCE 7-10.

c. NL = Not Limited and NP = Not Permitted. For metric units use 30.5 m for 100 ft and use 48.8 m for 160 ft.

d. See Section 12.2.5.4 of ASCE 7-10 for a description of seismic force-resisting systems limited to buildings with a structural height,  $h_n$ , of 240 ft (73.2 m) or less.

e. See Section 12.2.5.4 of ASCE 7-10 for seismic force-resisting systems limited to buildings with a structural height,  $h_n$ , of 160 ft (48.8 m) or less.

f. Ordinary moment frame is permitted to be used in lieu of intermediate moment frame for Seismic Design Categories B or C.

g. Where the tabulated value of the overstrength factor,  $\Omega_0$ , is greater than or equal to  $2^{1/2}$ ,  $\Omega_0$  is permitted to be reduced by subtracting the value of  $1/2$  for structures with flexible diaphragms.

h. See Section 12.2.5.7 of ASCE 7-10 for limitations in structures assigned to Seismic Design Category D.

i. See Section 12.2.5.6 of ASCE 7-10 for limitations in structures assigned to Seismic Design Category D.

(continued)

**TABLE 1613.8—continued**  
**DESIGN COEFFICIENT AND FACTORS FOR BASIC SEISMIC C-FORCE-RESISTING SYSTEMS**

- j. Steel ordinary concentrically braced frames are permitted in single-story buildings up to a structural height,  $h_n$ , of 60 ft (18.3 m) where the dead load of the roof does not exceed 20 psf (0.96 kN/m<sup>2</sup>) and in penthouse structures.
- k. An increase in structural height,  $h_n$ , to 45 ft (13.7 m) is permitted for single story storage warehouse facilities.
- l. In Section 2.2 of ACI 318. A shear wall is defined as a structural wall.
- m. In Section 2.2 of ACI 318. The definition of “special structural wall” includes precast and cast-in-place construction.
- n. In Section 2.2 of ACI 318. The definition of “special moment frame” includes precast and cast-in-place construction.
- o. Alternately, the seismic load effect with overstrength,  $E_{mh}$ , is permitted to be based on the expected strength determined in accordance with AISI S110.
- p. Cold-formed steel – special bolted moment frames shall be limited to one-story in height in accordance with AISI S110.

## SECTION BC 1614

### STRUCTURAL INTEGRITY DEFINITIONS

**1614.1 Definitions.** The following words and terms shall, for the purposes of this section, have the meanings shown herein.

**ALTERNATE LOAD PATH.** A secondary or redundant load path capable of transferring the load from one structural element to other structural elements.

**ALTERNATE LOAD PATH METHOD.** A design approach that accounts for an extreme event by providing alternate load paths for elements that are no longer able to carry load. In an alternate load path design, key elements are considered notionally removed, one at a time, and the structure is designed to transfer the loads from the removed element to other structural elements, as required by Section 1616.

**ASPECT RATIO.** The height of any portion of a building divided by its least dimension at the elevation from which the height is being measured.

**COLLAPSE.** Failure of a structural element to the extent that it can no longer support any load.

**ELEMENT.** A structural member or structural assembly.

**KEY ELEMENT.** An element of the structural system, including its connections, that meets one or more of the following criteria:

1. An element which when lost, results in more than local collapse.
2. An element that braces a key element, the failure of which results in failure of the key element (further secondary elements need not be considered key elements).
3. An element whose tributary area exceeds 3,000 square feet (279 m<sup>2</sup>)† on a single level.

**LOCAL COLLAPSE.** Failure of a structural element that results in the collapse of areas being directly supported by that element and not extending vertically more than three stories.

**RESPONSE RATIO.** The ratio of an ultimate response quantity (e.g., deflection) to its value at yield.

**ROTATION.** The angle, measured at the ends of a member, whose tangent is equal to the deflection of the member at midspan divided by half the length of the member.

**SPECIFIC LOCAL LOAD.** A load applied to a structural element or structural system as specified in Section 1616.7.

**SPECIFIC LOCAL RESISTANCE METHOD.** A design approach that accounts for extreme event loads by providing sufficient strength for elements that may fail. In a specific local resistance design, key elements are designed for specific local loads as required by Section 1616.

## SECTION BC 1615

### STRUCTURAL INTEGRITY—PRESCRIPTIVE REQUIREMENTS

**1615.1 Scope.** The intent of these provisions is to enhance structural performance under extreme event scenarios by providing additional overall system redundancy and local robustness. All structures shall be designed to satisfy the prescriptive requirements of this section.

**Exception:** Structures in Structural Occupancy Category I of Table 1604.5 and structures in Occupancy Group R-3 are exempt from the requirements of Sections 1614 through 1616.

**1615.2 Continuity and ties.** All structural elements shall have a minimum degree of continuity and shall be tied together horizontally and vertically as specified in Chapters 19, 21, and 22 for concrete, masonry and steel, respectively.

**1615.3 Lateral bracing.** Floor and roof diaphragms or other horizontal elements shall be tied to the lateral load-resisting system.

**1615.4 Reserved.**

**1615.5 Vehicular impact.** Structural columns that are directly exposed to vehicular traffic shall be designed for vehicular impact. Structural columns that are adequately protected by bollards, guard walls, vehicle arrest devices or other elements do not need to be designed for vehicular impact. The load combinations for vehicular impact shall be as specified in Section 1605.6.

Specific loads for vehicular impact shall be as follows:

1. Exterior corner columns shall be designed for a concentrated load of 40 kips applied horizontally in any direction from which a vehicle can approach at a height of either 18 inches (457 mm) or 36 inches (914 mm) above the finished driving surface, whichever creates the worst effect.
2. All other exterior columns exposed to vehicular traffic, and columns within loading docks, and columns in parking garages along the driving lane shall be designed for a concentrated load of 20 kips applied horizontally in any direction from which a vehicle can

approach at a height of either 18 inches (457 mm) or 36 inches (914 mm) above the finished driving surface, whichever creates the worst effect.

**1615.6 Gas explosions.** In buildings with gas piping operating at pressures in excess of 15 psig (103 kPa gauge), all key elements and their connections within 15 feet (4572 mm) of such piping shall be designed to resist a potential gas explosion. The structure shall be designed to account for the potential loss of the affected key elements one at a time by the alternate load path<sup>†</sup> method. Load combinations for the alternate load path<sup>†</sup> shall be as specified in Section 1605.5. In lieu of the alternate load path method<sup>†</sup>, the affected key elements shall be designed to withstand a load of 430 psf (20.6 kPa) applied using the load combinations specified in Section 1605.6. The load shall be applied along the entire length of the element, and shall be applied in the manner and direction that produces the most damaging effect.

#### Exceptions:

1. If a structural enclosure designed to resist the specified pressure is provided around the high-pressure gas piping, only the key elements within the structural enclosure need to comply with this section.
2. A reduced pressure for gas explosions can be used based on an engineering analysis approved by the commissioner.

**1615.6.1 Explosion prevention and deflagration venting.** The structural design and installation of explosion prevention systems and deflagration venting shall be in accordance with the requirements of Appendices E and G of the *New York City Fuel Gas Code*, as well as the *New York City Fire Code*, and the rules and regulations of the department.

## SECTION BC 1616 STRUCTURAL INTEGRITY—KEY ELEMENT ANALYSIS

**1616.1 Scope.** A key element analysis shall be performed for the following buildings:

1. Buildings included in Structural Occupancy Category IV as defined in this chapter.
2. Buildings with the aspect ratios of seven or greater.
3. Buildings greater than 600 feet (183 m) in height or more than 1,000,000 square feet (92 903 m<sup>2</sup>) in gross floor area.
4. Buildings taller than seven stories where any element, except for walls greater than 10 feet (3.048 m) in length, supports in aggregate more than 15 percent of the building area.
5. Buildings designed for areas with 3,000 or more occupants in one area in close proximity, including fixed seating and grandstand areas.
6. When specifically ordered by the commissioner.

**1616.2 Load combinations.** Where specifically required by Section 1616.1, elements and components shall be designed

to resist the forces calculated using the combination specified in Section 1605.5 or 1605.7 as applicable.

#### 1616.3 Reserved.

**1616.4 Seismic and wind.** When the code-prescribed seismic or wind design produces greater effects, the seismic or wind design shall govern, but the detailing requirements and limitations prescribed in this and referenced sections shall also be followed.

**1616.5 Joints.** Where a structure is divided by joints that allow for movement, each portion of the structure between joints shall be considered as a separate structure.

**1616.6 Key element analysis.** Where key elements are present in a structure, the structure shall be designed to account for their potential loss one at a time by the alternate load path method or by the specific local resistance method as specified in Section 1616.7.

**1616.7 The specific local resistance method.** Where the specific local resistance method is used key elements shall be designed using specific local loads as follows:

1. Each compression element shall be designed for a concentrated load equal to 2 percent of its axial load but not less than 15 kips, applied at midspan in any direction, perpendicular to its longitudinal axis. This load shall be applied in combination with the full dead load and 50 percent of the live load in the compression element.
2. Each bending element shall be designed for the combination of the principal acting moments plus an additional moment, equal to 10 percent of the principal acting moment applied in the perpendicular plane.
3. Connections of each tension element shall be designed to develop the smaller of the ultimate tension capacity of the member or three times the force in the member.
4. All structural elements shall be designed for a reversal of load. The reversed load shall be equal to 10 percent of the design load used in sizing the member.

**1616.8 Design criteria.** Alternate load path method and/or specific local resistance method for key elements shall conform to the appropriate design criteria as determined from Sections 1616.9, 1616.10 and 1616.11. Load combinations for the alternate load path method shall be as specified in Section 1605.5.

**1616.9 Analysis procedures.** All structural analysis for specific local loads or alternate load paths shall be made by one of the following methods:

**1616.9.1 Static elastic analysis.** For analysis of this type, dynamic effects of member loss or dynamic effects of specific local loads need not be considered. The structural demand is obtained from linear static analysis. However, structural member capacity is based on ultimate capacity of the entire cross section. The demand/capacity ratio of structural elements shall not exceed one.

**1616.9.2 Dynamic inelastic analysis.** For analysis of this type, dynamic effects of member loss or specific local loads shall be considered. The structure does not need to remain elastic; however, the response ratio and rotation

limits obtained from Table 1616.9.3 shall not be exceeded.

**1616.9.3‡ Energy methods.** Static inelastic analysis using energy equilibrium may also be used. The structure does not need to remain elastic; however, the response ratio and rotation limits obtained from Table 1616.9.3 shall not be exceeded.

**TABLE 1616.9.3  
RESPONSE RATIO AND ROTATION LIMITS**

ELEMENT	RESPONSE RATIO	ROTATION
Concrete slabs	$\mu < 10$	$\theta < 4^\circ$
Post-tensioned beams	$\mu < 2$	$\theta < 1.5^\circ$
Concrete beams	$\mu < 20$	$\theta < 6^\circ$
Concrete columns	$\mu < 2$	$\theta < 6^\circ$
Long span acoustical deck	$\mu < 2$	$\theta < 3^\circ$
Open web steel joists	$\mu < 2$	$\theta < 6^\circ$
Steel beams	$\mu < 20$	$\theta < 10^\circ$
Steel columns	$\mu < 5$	$\theta < 6^\circ$

For SI: 1 degree = 0.01745 rad.

**Note:** Table 1616.9.3 is intended for SDOF and simplified MDOF response calculations and a low level of protection. Table 1616.9.3 does not apply for explicit finite element methods that calculate the performance of the structural elements in response to the specified loading intensity. Steel joists: downward loading 6 degrees, upward loading ductility of 2.

**1616.10 Minimum response.** Structural response of elements determined using a dynamic inelastic analysis shall not be less than 80 percent of the structural response determined using a static elastic analysis.

**1616.11 Strength reduction factors.** For structural design for specific local loads or alternate load paths, all strength reduction factors may be taken as one.

## SECTION BC 1617 STRUCTURAL PEER REVIEW

**1617.1 General.** The provisions of this section specify where structural peer review is required, how and by whom it is to be performed.

**1617.2 Where required.** A structural peer review of the primary structure shall be performed a report provided for the following buildings:

1. Buildings included in Structural Occupancy Category IV as defined in this chapter and more than 50,000 square feet (4645 m<sup>2</sup>) of framed area.
2. Buildings with aspect ratios of seven or greater.
3. Buildings greater than 600 feet (183 m) in height or more than 1,000,000 square feet (92 903 m<sup>2</sup>) in gross floor area.
4. Buildings taller than seven stories where any element, except for walls greater than 10 feet (3.048 meters) in length, supports in aggregate more than 15 percent of the building area.
5. Buildings designed using nonlinear time history analysis or with special seismic energy dissipation systems.

6. ‡Buildings designed for areas with 3,000 or more occupants in one area in close proximity, including fixed seating and grandstand areas.

7. ‡Buildings where a structural peer review is requested by the commissioner.

**1617.3 Structural peer review.** It shall be verified that the structural design is in general conformance with the requirements of this code.

**1617.4 Structural peer reviewer.** The structural peer review shall be performed by a qualified independent structural engineer who has been retained by or on behalf of the owner. A structural peer reviewer shall meet the requirements of the rules of the department.

### 1617.5 Extent of the structural peer review.

**1617.5.1 Scope.** The structural peer reviewer shall review the plans and specifications submitted with the permit application for general compliance with the structural and foundation design provisions of this code. The reviewing engineer shall perform the following tasks at a minimum:

1. Confirm that the design loads conform to this code.
2. Confirm that other structural design criteria and design assumptions conform to this code and are in accordance with generally accepted engineering practice.
3. Review geotechnical and other engineering investigations that are related to the foundation and structural design and confirm that the design properly incorporates the results and recommendations of the investigations.
4. Review the structural frame and the load supporting parts of floors, roofs, walls and foundations. Cladding, cladding framing, stairs, equipment supports, ceiling supports, non-loadbearing partitions, railings and guards, and other secondary structural items shall be excluded.
5. ‡Confirm that the structure has a complete load path.
6. ‡Perform independent calculations for a representative fraction of systems, members, and details to check their adequacy. The number of representative systems, members, and details verified shall be sufficient to form a basis for the reviewer's conclusions.
7. ‡Verify that performance-specified structural components (such as certain precast concrete elements) have been appropriately specified and coordinated with the primary building structure.
8. ‡Verify that the design engineer of record complied with the structural integrity provisions of the code.
9. Review the structural and architectural plans for the building. Confirm that the structural plans are in general conformance with the architectural



plans regarding loads and other conditions that may affect the structural design.

10. Confirm that major mechanical items are accommodated in the structural plans.
11. Attest to the general completeness of the structural plans and specifications.

**1617.5.2 Structural design criteria.** If the design criteria and design assumptions are not shown on the drawings or in the computations, the structural engineer of record shall provide a statement of these criteria and assumptions for the reviewer. In addition, the design engineer shall provide information and/or calculations, if requested by the peer reviewer.

#### 1617.6 Structural peer review report.

**1617.6.1 General.** The reviewing engineer shall submit a report to the department stating whether or not the structural design shown on the plans and specifications generally conforms to the structural and foundation requirements of this code.

**1617.6.2 Contents.** The report shall demonstrate, at a minimum, compliance with Items 1 through 11 of Section 1617.5.1. In addition, the report shall also include the following:

1. The codes and standards used in the structural design of the project.
2. The structural design criteria, including loads and performance requirements.
3. The basis for design criteria that are not specified directly in applicable codes and standards. This should include reports by specialty consultants such as wind tunnel study reports and geotechnical reports. Generally, the report should confirm that existing conditions at the site have been investigated as appropriate and that the design of the proposed structure is in general conformance with these conditions.

**1617.6.3 Phased submission.** If an application is submitted for a permit for the construction of foundations or any other part of a building before the construction documents for the whole building have been submitted, then the structural peer review and report shall be phased. The structural peer reviewer shall be provided with sufficient information on which to make a structural peer review of the phased submission.

#### 1617.7 Responsibility.

**1617.7.1 Structural engineer of record.** The structural engineer of record shall retain sole responsibility for the structural design. The activities and reports of the structural peer reviewer shall not relieve the structural engineer of record of this responsibility.

**1617.7.2 Structural peer reviewer.** The structural peer reviewer's report states his or her opinion regarding the design by the engineer of record. The standard of care to which the structural peer reviewer shall be held in the performance of the structural peer review and report is that the level of skill and care are consistent with structural peer.

## SECTION 1618 LOADS ON TEMPORARY INSTALLATIONS

**1618.1 General.** Installations governed by this code shall be defined as temporary when such installations are intended to be taken apart or removed after a limited period following their installation, including, but not limited to, tents, scaffolds, sidewalk sheds, cranes, and run back structures. Temporary installations shall comply with all the provisions of this code, except as described in Sections 1618.1.1 through 1618.3.2.

**1618.1.1 Duration.** Such limited period shall not exceed one year for temporary installations used in construction operations covered by Chapter 33. For temporary installations covered by Section 3103, the limited period shall not exceed ninety days. The limited period shall be counted from the date the temporary installation is substantially installed.

**1618.1.1.1 Extension of time.** Subject to the approval of the commissioner, a request to extend the time for a temporary installation, subject to the limits in Section 1618.1.1, shall be accompanied by the submission of a report from a registered design professional that certifies the following:

1. Such registered design professional performed an inspection within the last 30 days to confirm that the installation complies with the requirements of the approved construction documents for the temporary installation; and
2. The action plan required by Section 1618.3:
  - 2.1. Is still in effect;
  - 2.2. Has been revised to reflect the current conditions of the installation; or
  - 2.3. Is no longer required, as the installation has been retrofitted to comply with the loads for new construction without any reduction, pursuant to Section 1618.2.

**1618.1.2 Construction documents.** Any temporary installation utilizing the exemptions and load reductions in the structural design shall be prominently indicated on drawings as temporary, and all reduced loads shall be indicated on the drawings. The environmental load mitigations shall be indicated on the construction documents. The construction documents shall be maintained at the site of the temporary installation and be available to the department upon request.

**1618.2 Loads.** Temporary installations shall be designed and constructed to resist the loads required by Chapter 16 of this code for new construction.

**Exception:** Temporary installations that are accompanied by an action plan in accordance with Section 1618.3 shall be permitted to reduce the design environmental loads required by Chapter 16 of this code as follows:

1. Seismic. Temporary installations shall be permitted to use 2 percent of the design dead and live load in lieu of the seismic forces required by Section 1614 in load combinations including seismic forces. This

load shall be distributed in proportion to the design loads, shall be applied in any horizontal direction and need not be combined with other environmental loads.

2. Wind. The wind design for temporary installations shall be computed as required by Section 1609. The basic wind speed used to design the structure shall be permitted to be reduced by applying a factor of 0.8.
3. Other environmental forces. Other environmental forces, including, but not limited to, snow, ice, and temperature differential effects, shall be permitted to be reduced as appropriate for the limited exposure of the installation.

**1618.3 Action plan.** All temporary installations reducing the design environmental loads in accordance with Section 1618.2 shall include environmental load mitigation measures as part of an action plan. The action plan measures shall be indicated on the drawings.

**1618.3.1 Implementation.** The action plan shall be such that it may be reliably implemented in one day's notice or less as appropriate for the actions.

**1618.3.2 Components.** The action plan shall, at a minimum, include the following:

1. Threshold of predicted environmental loads;
2. Method of monitoring environmental loads;
3. Party responsible for monitoring loads and determining implementation of action plan;
4. Party responsible for effectuating the action plan;
5. Evacuation procedures;
6. Safety zone, standoff distance or standoff perimeter as appropriate. Safety zone, standoff distance or standoff perimeter shall not extend beyond the property line;
7. Any other activities, such as the addition or removal of structural and/or nonstructural elements, removal of loads or creating sacrificial elements so that the structure may resist unreduced forces as required for permanent structures;
8. Plan to prevent wind-born debris; and
9. Verification that the design and procedures shall not adversely impact other structures.



## CHAPTER 17

**SECTION BC 1701  
GENERAL**

**1701.1 Scope.** The provisions of this chapter shall govern the inspection of quality, workmanship and requirements for construction. Materials, inspection and testing shall conform to the applicable standards listed in this code or in the rules of the department. See Chapter 1 of Title 28 of the *Administrative Code* for additional provisions relating to materials, testing and inspections.

**1701.2 New materials.** See Chapter 1 of Title 28 of the *Administrative Code* for additional provisions.

**1701.3 Used materials.** See Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 1702 DEFINITIONS

**1702.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**APPROVED AGENCY.** See Chapter 1 of Title 28 of the *Administrative Code*.

**APPROVED FABRICATOR.** An established and qualified person, firm or corporation approved by the commissioner to custom manufacture or build products or assemblies regulated by this code.

**CERTIFICATE OF COMPLIANCE.** A certificate stating that materials meet specified standards, that work was done in compliance with approved construction documents and other applicable provisions of law, or with respect to specified service equipment, a certificate issued by the department authorizing the operation of such equipment.

**FABRICATED ITEM.** Products and assemblies regulated by this code that are custom manufactured, or built prior to their incorporation into the work at the job site. Fabricated items shall not include listed, labeled or approved products or assemblies.

**INSPECTION CERTIFICATE.** An identification applied on a product by an approved agency containing the name of the manufacturer, the function and performance characteristics, and the name and identification of the approved agency that indicates that the product or material has been inspected and evaluated by such approved agency. An inspection certificate shall also mean a certificate issued by the department upon satisfactory completion of an inspection or test.

**INTUMESCENT FIRE-RESISTANT COATINGS.** Thin film liquid mixture applied to substrates which expands into a protective foamed layer to provide fire-resistant protection of the substrates when exposed to flame or intense heat.

**MASTIC FIRE-RESISTANT COATINGS.** Liquid mixture applied to a substrate that provides fire-resistant protection of a substrate when exposed to flame or intense heat.

**LABEL.** An identification applied on a product by the manufacturer that contains the name of the manufacturer, the function and performance characteristics of the product or material, and the name and identification of an approved agency and that indicates that a representative sample of the product or material has been tested and evaluated by an approved agency for compliance with nationally recognized standards or tests to determine suitable usage in a specified manner.

**MANUFACTURER'S DESIGNATION.** An identification applied on a product by the manufacturer indicating that a product or material complies with a specified standard or set of rules.

**MARK.** An identification applied on a product by the manufacturer indicating the name of the manufacturer and the function of a product or material.

**SPECIAL INSPECTION.** Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections, to ensure compliance with approved construction documents and referenced standards as required by this chapter or elsewhere in this code or its referenced standards.

**SPECIAL INSPECTION, CONTINUOUS.** The full-time observation of work requiring special inspection by a special inspector who is continuously present in the area where the work is being performed.

**SPECIAL INSPECTION, PERIODIC.** The intermittent observation of work requiring special inspection by a special inspector who is present in the area where the work has been or is being performed and at the completion of the work. All work requiring special inspection shall remain accessible and exposed until approved by the special inspector.

**SPECIAL INSPECTOR.** See Chapter 1 of Title 28 of the *Administrative Code*.

**SPRAYED FIRE-RESISTANT MATERIALS.** Cementitious or fibrous materials that are sprayed to provide fire-resistant protection of the substrates.

**SUPERINTENDENT OF CONSTRUCTION.** See Chapter 1 of Title 28 of the *Administrative Code*.

## SECTION BC 1703 APPROVALS

See Chapter 1 of Title 28 of the *Administrative Code*.



## SECTION BC 1704 SPECIAL INSPECTIONS

**1704.1 General.** Where application is made for construction as described in this section, one or more special inspection agencies meeting the requirements of Sections 28-114.1 and 28-115.1 of the *Administrative Code* shall be retained by the owner to provide inspections during construction on the types of work listed under Section 1704 and elsewhere in this code. These inspections are in addition to the other inspections required by Section 110, elsewhere in this code, and Section 28-116 of the *Administrative Code*. The special inspector shall be acceptable to the registered design professional of record.

**Exception:** Special inspections are not required for building components unless the design involves the practice of professional engineering or architecture as defined by the *Education Law of the State of New York* and applicable regulations governing the professional registration and certification of engineers or architects.

**1704.1.1 Responsibilities of the registered design professional of record.** The registered design professional of record shall have the following duties and responsibilities:

- 1. Construction document requirements.** The registered design professional of record shall identify the materials, equipment, installation, fabrication, erection or placement of components and connections, or construction operations for the work indicated on the construction documents that are subject to special inspections on the construction documents and on forms supplied by the department prior to the approval of the construction documents.
- 2. Respond to field discrepancies.** The registered design professional of record shall respond to special inspector reports of uncorrected discrepancies and shall approve remedial measures.
- 3. Review of shop drawings.** Where shop or working drawings have been provided, the registered design professional of record shall review such shop drawings for conformance with the approved design.
- 4. Deviations from approved construction documents.** The registered design professional of record shall submit to the department and the special inspection agency written documentation of the professional's approval of deviations from the approved construction documents. All such deviations approved by the registered design professional of record shall be filed with the department on amended construction documents in accordance with Section 28-104.3 of the *Administrative Code*.

**1704.1.2 Responsibilities of the special inspection agency.** The special inspection agency shall have the following duties and responsibilities:

- 1. Independence.** The special inspection agency shall be independent of the contractors responsible for the work being inspected. The registered design professional of record is permitted to act as the approved special inspection agency and such agency's person-

nel are permitted to act as special inspectors for the work designed by the registered design professional of record, provided those personnel meet the qualification requirements of this section to the satisfaction of the department.

- 2. Construction documents.** The special inspection agency shall examine all approved construction documents that relate to the work that is the subject of the special inspections to confirm that the documents are sufficient to enable the proper performance of the special inspection. The special inspection agency shall confirm that any shop drawings or sketches have been accepted by the registered design professional of record. Acceptance shall be demonstrated in writing by the registered design professional of record on the documents.
- 3. Inspection.** The special inspection agency shall observe work subject to special inspection to confirm that the work that is the subject of the special inspection is in compliance with the approved construction documents; with the approved shop drawings, where provided; and with the special inspection requirements of this code and department rules and regulations.
- 4. Reports.** The special inspection agency shall prepare reports of its inspections and tests, and such reports shall indicate that work inspected was or was not performed in conformance with approved construction documents.
  - 4.1. Format.** Special inspection reports and records of special inspections shall be in the form and format supplied by the commissioner.
  - 4.2. Discrepancies.** Discrepancies shall be brought to the immediate attention of the contractor and, when applicable, to the superintendent of construction, for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the owner, and the registered design professional of record prior to the completion of that phase of the work.
  - 4.3. Hazardous conditions.** The special inspector shall report conditions noted as hazardous to life, safety or health that are not immediately corrected to the immediate attention of the commissioner.
  - 4.4. Final report.** Prior to issuance of a certificate of occupancy or letter of completion, a final report documenting the required special inspections and correction of all discrepancies noted in the inspections shall be submitted to the department, certifying compliance with approved construction documents and the administrative and procedural requirements of this code.
  - 4.5. Approval of partially completed work.** Reports of partially completed work shall be accepted when such reports indicate that the

inspected work has been completed in accordance with the construction documents and the condition of the remaining work.

- 4.6. **Maintain records.** The special inspection agency shall keep records of inspections for a period of 6 years from the date of project sign-off. Such records shall be supplied to the commissioner upon request. The commissioner may require that special inspection reports be filed with the department and/or that such reports be otherwise made accessible for review.

**1704.1.3 Responsibilities of the permit holder.** The permit holder shall have the following duties and responsibilities:

1. **Statement of special inspections.** The application for permit shall include a statement of relevant special inspections as a condition for permit issuance on forms supplied by the department. This statement shall include:
  - 1.1. A complete list of materials and work included in the permit application requiring special inspections by this section and elsewhere in this code and the inspections to be performed on such work and materials; and
  - 1.2. A list of the special inspection agencies retained by the owner for conducting the special inspections listed on the approved plans. Within each category of work, multiple special inspectors or special inspection agencies may be employed.
2. **Identification of registered design professionals providing design documents for certain construction operations.** The registered design professionals responsible for the production of design, sequence of construction operations or shop drawings for projects that require design pursuant to Chapter 33, shall file documentation of their intent to perform those duties on forms supplied by the department.
3. **Required notification to special inspection agencies.** The holder of a permit covering work requiring a special inspection shall notify the relevant special inspectors or special inspection agencies in writing at least 72 hours before the commencement of any work requiring special inspection.
4. **Access for special inspection.** The construction or work for which special inspection is required shall remain accessible and exposed for special inspection purposes until completion of the required special inspections.
5. **Deficiencies.** The permit holder shall be responsible for the correction of identified deficiencies. A satisfactory inspection by a special inspection agency or the acceptance by the department of a satisfactory report of an inspection by a special inspection agency shall not be construed to be an approval by the department of a violation of the provisions of this code or of any other provision of law.

**1704.2 Inspection of fabricators.** Where fabrication of structural members, and other regulated products is performed on the premises of a fabricator's shop, special inspection and progress inspection of the fabricated items shall be required by this section, the *New York City Construction Codes*, and in Chapter 1 of Title 28 of the *Administrative Code*.

**1704.2.1 Fabrication and implementation procedures.**

The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

**Exception:** Special inspections and progress inspections as required by Section 1704.2 shall not be required where the fabricator is approved in accordance with Section 1704.2.2 and with Chapter 1 of Title 28 of the *Administrative Code*.

**1704.2.2 Fabricator approval.** Work that is subject to special inspection and performed on the approved fabricator's premises shall be inspected by the special inspection agency in accordance with Section 1704.2.2.3. Approval of fabricators shall be based upon review of the fabricator's written procedural and quality control manuals and periodic auditing of fabrication practices by an approved agency.

**1704.2.2.1 Certificate of intent to fabricate.** For all work where approval is sought based upon Section 1704.2.2, the approved fabricator shall submit a certificate of intent to fabricate such work to the department identifying the work to be performed as an approved fabricator, and that such work shall be performed in accordance with the approved construction documents, referenced standards and applicable provisions of law and for which site the work is being fabricated prior to fabricating any items for such project.

**1704.2.2.2 Fabricator's certificate of compliance.** For all fabricated items, the approved fabricator shall submit a certificate of compliance to the department stating that the work was performed in accordance with the approved construction documents, referenced standards and applicable provisions of law.

**1704.2.2.3 In-plant special inspections.** The owner shall engage an approved special inspection agency to perform special inspections for the portion of the work performed in the approved fabricator's premises. These inspections shall at a minimum include: (i) one visit to the fabricator's premises during the course of the subject work to verify the fabricator's compliance with the written and procedural quality control manuals; and (ii) inspection of 5 percent of the subject work to verify compliance with the approved construction documents. Such inspection is permitted to be performed in either the fabricator's premises or at the construction site.

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**1704.3 Steel construction.** The special inspections of new installations and alterations to existing installations of steel elements in buildings and structures shall be as required by Section 1704.3 and Table 1704.3. Where required, special inspection of steel shall also comply with Section 1716.

**Exceptions:**

1. Special inspection of the steel fabrication process shall not be required where the fabricator does not perform any welding, thermal cutting or heating operation of any kind as part of the fabrication process. In such cases, the fabricator shall be required to submit a detailed procedure for material control that demonstrates the fabricator's ability to maintain suitable records and procedures such that, at any time during the fabrication process, the material specification, grade and mill test reports for the main stress-carrying elements are capable of being determined.
2. The special inspector need not be continuously present during welding of the following items, provided the materials, welding procedures and qualifications of welders are verified prior to the start of the work; periodic inspections are made of the work in progress and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.
  - 2.1. Single-pass fillet welds not exceeding  $\frac{5}{16}$  inch (7.9 mm) in size.
  - 2.2. Floor and roof deck welding.
  - 2.3. Welded studs when used for structural diaphragm.
  - 2.4. Welded sheet steel for cold-formed steel members.
  - 2.5. Welding of stairs and railing systems.
  - 2.6. Welding of connections where the calculated connection strength is at least twice the required strength of the connection. Such connections shall be specifically indicated on the approved construction documents.

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**1704.3.1 Welding.** Welding inspection and welding inspector qualification shall be in compliance with this section and the rules of the department.

**1704.3.1.1 Structural steel.** Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1.

**1704.3.1.2 Cold-formed steel.** Welding inspection and welding inspector qualification for cold-formed steel floor and roof decks shall be in accordance with AWS D1.3.

**1704.3.1.3 Reinforcing steel.** Welding inspection and welding inspector qualification for reinforcing steel shall be in accordance with AWS D1.4 and ACI 318.

**1704.3.2 Details.** The special inspector shall perform an inspection of the steel frame to verify compliance with

the details shown on the approved construction documents, such as bracing, stiffening, member locations and proper application of joint details at each connection, including connections designed for seismic effects. NYC

**1704.3.3 High-strength bolts.** Installation of high-strength bolts shall be inspected in accordance with this section and AISC 360. NYC

**Exception:** Installation of high strength bolts in bearing type connections where the calculated connection strength is at least twice the required strength of the connection. Inspection of such connections shall be made under Section 1704.3.2. Such connections shall be clearly indicated on the approved construction documents. NYC  
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**1704.3.3.1 General.** While the work is in progress, the special inspector shall determine that the requirements for bolts, nuts, washers and paint; bolted parts and installation and tightening in such standards are met. For bolts requiring pretensioning, the special inspector shall observe the preinstallation testing and calibration procedures when such procedures are required by the installation method or by project plans or specifications; determine that all plies of connected materials have been drawn together and properly snugged and monitor the installation of bolts to verify that the selected procedure for installation is properly used to tighten bolts. For joints required to be tightened only to the snug-tight condition, the special inspector need only verify that the connected materials have been drawn together and properly snugged.

**1704.3.3.2 Periodic inspection.** Inspection of bolt installation for pretensioning is permitted to be performed on a periodic basis when using the turn-of-nut method with matchmarking techniques, the direct tension indicator method or the alternate design fastener (twist-off bolt) method. Joints designated as snug tight need be inspected only on a periodic basis. NYC

**1704.3.3.3 Continuous inspection.** Inspection of bolt installation for pretensioning using the calibrated wrench method or the turn-of-nut method without matchmarking shall be performed on a continuous basis. NYC

**1704.3.4 Cold-formed steel construction.** Special inspections for prefabricated and site built cold-formed steel light-frame construction and assemblies shall be as required by this section and Table 1704.3.4. The special inspector shall verify the size, quality, framing, erection, and both temporary and permanent bracing. NYC  
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**1704.4 Concrete construction.** The special inspections and verifications for concrete construction shall be as required by this section and Table 1704.4.

**Exceptions:**

1. Special inspection shall not be required when specifically indicated as not required on the approved construction documents for: NYC  
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**TABLE 1704.3**  
**REQUIRED VERIFICATION AND INSPECTION OF STEEL CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD <sup>a</sup>	BC REFERENCE	
1. Material verification of high-strength bolts, nuts and washers:					
a. Identification markings to conform to ASTM standards specified in the approved construction documents.	—	X	AISC 360, Section A3.3 and applicable ASTM material specifications	—	
b. Manufacturer's certificate of compliance required.	—	X	—	—	
2. Inspection of high-strength bolting:					
a. Snug-tight joints.	—	X Note b			NYC
b. Pre-tensioned and slip-critical joints using turn-of-nut with matchmarking, twist-off bolt or direct tension indicator methods of installation.	—	X	AISC 360 Section M2.5	1704.3.3	
c. Pre-tensioned and slip-critical joints using turn-of-nut without matchmarking or calibrated wrench methods of installation.	X	—			
3. Material verification of structural steel and cold formed steel deck:					
a. For structural steel, identification markings to conform to AISC 360.	—	X	AISC 360, Section M5.5		
b. $\nabla$ For other steel, identification markings to conform to ASTM standards specified in the approved construction documents.	—	—	Applicable ASTM Standards $\nabla$	—	NYC
c. $\nabla$ Manufacturers' certified mill test reports.	—	X $\nabla$	Applicable ASTM material standards		NYC
4. Material verification of weld filler materials:					
a. Identification markings to conform to AWS specification in the approved construction documents.	—	—	AISC 360, Section A3.5 and applicable AWS A5 documents	—	NYC
b. Manufacturer's certificate of compliance required.	—	—	—	—	NYC
5. Inspection of welding:					
a. Structural steel, cold-formed steel and cold-formed steel deck:	—	—			NYC
1) Complete and partial penetration groove welds.	X	—			NYC
2) Multipass fillet welds.	X	—			
3) Single-pass fillet welds > 5/16".	X	—	AWS D1.1	1704.3.1	
4) $\nabla$ Plug and slot welds.	X $\nabla$	— $\nabla$			
5) $\nabla$ Single-pass fillet welds $\leq$ 5/16".	—	X			
6) $\nabla$ Floor and roof deck welds.	—	X	AWS D1.3	—	
7) Cold-formed steel welds.	— $\nabla$	X	AWS D1.3	$\nabla$	NYC
b. Reinforcing steel:	—	—			
1) Verification of weldability of reinforcing steel other than ASTM A 706.	—	X			
2) Reinforcing steel-resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special reinforced concrete shear walls and shear reinforcement.	X	—	AWS D1.4 ACI 318: 3.5.2	1903.5.2	NYC
3) Shear reinforcement.	X Note a	—			NYC
4) Other reinforcing steel.	—	X			
6. Inspection of steel frame joint details for compliance with approved construction documents:					NYC
a. Details such as bracing and stiffening.	—	X	—	1704.3.2	NYC
b. Member locations.	—	X $\nabla$			
c. Application of joint details at each connection.	—	X $\nabla$			

For SI: 1 inch = 25.4 mm.

a. A minimum of 10 percent of shear studs shall be verified for strength of welded connection. If failure is evident on one or more, then the strength of all shear studs shall be verified.

b. Turn of the nut bolting shall be continuously inspected.

**Exception:** Periodic inspection shall be acceptable when the contractor's procedures have been established and verified for compliance by the special inspector.

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VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	CODE REFERENCE
1. Material Verification:				
a. Verify that identification markings conform to AISI S200 and as specified in the approved construction documents.		X	AISI 200, Section A5.4	
b. Verify that material is clean, straight and undamaged.		X		
2. Inspection of general framing:				
a. Verify that member sizes conform to the approved construction documents.		X		
b. Verify that member layout conforms to the approved construction documents.		X		
c. Verify that proper bearing lengths are provided in accordance with approved construction documents.		X		
d. Verify that punched holes and sheared or flame cut edges of material in members are clean and free from notches and burred edges.		X		
3. Inspection of framing connections and anchorages:				
a. Verify that screws, bolts, and other fasteners conform to approved construction document requirements for diameter, length, quantity, spacing, edge distance, and location.		X	AISI S200, Section D	
b. Verify that manufactured connectors, such as joist hangers, caps, straps, clips, ties, hold-downs, and anchors conform to approved construction document requirements for manufacturer, type, gauge, and fastener requirements.		X	AISI S200, Section D	
4. Inspection of welding:				
a. Inspect welds in accordance with Table 1704.3.		X	AWS D1.3	
5. Bracing:				
a. Verify that temporary bracing, shoring, jacks, etc., are installed, and not removed until no longer necessary, in accordance with the approved construction documents and approved erection drawings.		X		
b. Verify that permanent bracing, web stiffeners, bridging, blocking, wind bracing, etc, are installed in accordance with the approved construction documents and approved erection drawings.		X		
c. <del>†</del> Where a cold-formed steel truss clear span is 60 feet (18 288 mm) or greater, the special inspector shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.		X		2210.3.4



- 1.1. Nonstructural concrete slabs supported directly on the ground, including prestressed slabs ongrade, where the effective prestress in the concrete is less than 150 psi (1.03 Mpa).‡
- 1.2. Concrete foundation(s) for lightweight fences and recreational equipment.‡
- 1.3. Concrete patios, site furnishings, garden walls, driveways, sidewalks and similar construction.‡
2. Testing required by Table 1704.4, Item 6, may be waived by the registered design professional who prepared the structural construction documents when such waiver is specifically indicated on such construction document in the following cases:
  - 2.1. Where the total concrete placement on a given project is less than 50 cubic yards (38 m<sup>3</sup>).‡

- 2.2. Isolated spread concrete footings of R-3 buildings three stories or less above grade plan that are fully supported on earth or rock.
- 2.3. Continuous concrete footings supporting walls of R-3 buildings three stories or less above grade plan that are fully supported on earth or rock where the structural design of the footing is based on a specified compressive strength,  $f'_c$ , ‡ no greater than 2,500 pounds per square inch (psi) (17.2 Mpa), and the compressive strength used in the footing construction is at least 4,000 psi.

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**TABLE 1704.4  
REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	BC REFERENCE	
1. Inspection of reinforcing steel, including prestressing tendons and placement.	—	X	ACI 318: 3.5, 7.1 – 7.7	1903.5, 1907.1, 1907.7, 1913.4	NYC NYC
2. Inspection of reinforcing steel welding in accordance with Table 1704.3, Item 5b.	—	—	AWS D1.4 ACI 318: 3.5.2	1903.5.2	NYC
3. Inspection of bolts to be installed in concrete prior to and during placement of concrete where allowable loads have been increased or where strength design is used.	X	—	‡ACI 318: 8.1.3, 21.2.8	1911.5, 1912.1	
4. Inspection of anchors installed in hardened concrete.‡	—‡	X	ACI 318: 3.8.6, 8.1.3, 21.2.8	1912.1	
5. Verifying use of required design mix.	—	X	ACI 318: Ch. 4, 5.2-5.4	1904, 1905.2–1905.4, 1913.3	NYC
6. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump, unit weight, and air content tests, and determine the temperature of the concrete. Determine water content when required.	X	—	ASTM C 172 ASTM C 31 ACI 318: 5.6, 5.8 (Note a, b)	1905.6, 1913.10	NYC NYC NYC NYC
7. Inspection of concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 5.9, 5.10	1905.9, 1905.10, 1913.6, 1913.7, 1913.8	NYC NYC NYC
8. Inspection for maintenance of specified curing temperature and techniques. Monitoring of in-place temperatures per thermal protection plan when required.	—	X	ACI 318: 5.11–5.13	1905.11, 1905.13, 1913.9	NYC
9. Inspection of prestressed concrete: a. Application of prestressing forces. b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.	X X	—	ACI 318: 18.20 ACI 318: 18.18.4	—	
10. Erection of precast concrete members.	—	X	ACI 318: Ch. 16	—	
11. Verification of in-situ concrete strength, prior to Stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 6.2	1906.2	NYC
12. Inspection of formwork for shape, location, and dimensions of the concrete member being formed.	—	X	ACI 318: 6.1.1	1906.2	NYC

a. Standard sampling rate shall be in accordance with Section 1905.6.2.

b. Four-inch by 8-inch cylinders may be accepted in lieu of 6-inch by 12-inch cylinders at the option of the engineer of record.

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the material in Chapter 3 of ACI 318. Weldability of reinforcement, except that which conforms to ASTM A 706, shall be determined in accordance with the requirements of Section 1903.5.2.

**1704.4.2 Concrete construction.** When the specified compressive strength of concrete in a column is greater than 1.4 times that specified for a floor system, the special inspections for concrete construction shall also comply with the requirements of Section 1908.2.1.

**1704.5 Masonry construction.** Masonry construction shall be inspected and verified in accordance with the requirements of Sections 1704.5.1 through 1704.5.3, depending on

the structural occupancy category of the building or structure.

**Exception:** Special inspections shall not be required for:

1. Masonry fireplaces, masonry heaters or masonry chimneys installed or constructed in accordance with Section 2111, 2112, or 2113, respectively.
2. ‡Alterations to existing masonry, where the quantity of replaced masonry is less than 10 square feet (0.93 m<sup>2</sup>) in any 100 square feet (9.3 m<sup>2</sup>) of wall area, when specifically exempted on the approved construction documents.

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**TABLE 1704.5.1**  
**LEVEL 1 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**

VERIFICATION AND INSPECTION	FREQUENCY OF INSPECTION		REFERENCE FOR CRITERIA		
	Continuous	Periodic	BC Section	TMS 402/ACI 530/ASCE 5 <sup>a</sup>	TMS 602/ACI 530.1/ASCE 6 <sup>a</sup>
1. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.	—	X	—	—	Art. 1.5
2. Verification of $f'_m$ and $f'_{AAC}$ prior to construction except where specifically exempted by this code.	—	X	—	—	Art. 1.4B
3. Verification of slump flow and VSI as delivered to the site for self-consolidating grout.	X	—	—	—	Art. 1.5B.1.b.3
4. As masonry construction begins, the following shall be verified to ensure compliance:					
a. Proportions of site-prepared mortar.	—	X	—	—	Art. 2.6A
b. Construction of mortar joints.	—	X	—	—	Art. 3.3B
c. Location of reinforcement, connectors, prestressing tendons and anchorages.	—	X	—	—	Art. 3.4, 3.6A
d. Prestressing technique.	—	X	—	—	Art. 3.6B
e. Grade and size of prestressing tendons and anchorages.	—	X	—	—	Art. 2.4B, 2.4H
5. During construction the inspection program shall verify:					
a. Size and location of structural elements.	—	X	—	—	Art. 3.3F
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	—	X	—	Sec. 1.2.2(e), 1.16.1	—
c. Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages.	—	X	—	Sec. 1.15	Art. 2.4, 3.4
d. Welding of reinforcing bars.	X	—	—	Sec. 2.1.9.7.2, 3.3.3.4(b)	—
e. Preparation, construction and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	—	X	Sec. 2104.3, 2104.4	—	Art. 1.8C, 1.8D
f. Application and measurement of prestressing force.	X	—	—	—	Art. 3.6B
6. Prior to grouting, the following shall be verified to ensure compliance:					
a. Grout space is clean.	—	X	—	—	Art. 3.2D
b. Placement of reinforcement and connectors, and prestressing tendons and anchorages.	—	X	—	Sec. 1.13	Art. 3.4
c. Proportions of site-prepared grout and prestressing grout for bonded tendons.	—	X	—	—	Art. 2.6B
d. Construction of mortar joints.	—	X	—	—	Art. 3.3B
7. Grout placement shall be verified to ensure compliance:	X	—	—	—	Art. 3.5
a. Grouting of prestressing bonded tendons.	X	—	—	—	Art. 3.6C
8. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.	—	X	Sec. 2105.2.2, 2105.3	—	Art. 1.4

For SI: °C = [(°F) - 32]/1.8.

a. The specific standards referenced are those listed in Chapter 35.

**1704.5.1 Empirically designed masonry, glass unit masonry and masonry veneer in buildings in structural occupancy category IV.** The minimum inspection program for empirically designed masonry, glass unit masonry and masonry veneer designed by Section 2109, 2110, or Chapter 14, respectively, or by Chapter 5, 6 or 7 of TMS 402/ACI 530/ASCE 5, in structures classified as structural occupancy category IV, in accordance with Table 1604.5, shall comply with Table 1704.5.1.

**1704.5.2 Masonry in buildings less than three stories in height in structural occupancy category I, II, or III.** The minimum special inspection program for structures classified as structural occupancy categories I, II, or III, in accordance with Table 1604.5, which are three stories or less in height, shall comply with Table 1704.5.1.

**1704.5.3 Masonry in buildings three stories or more in height, and engineered masonry in structural occupancy category IV.** The minimum special inspection program for masonry designed by Section 2107 or 2108, or by chapters other than Chapters 5, 6 or 7 of TMS 402/ACI 530/ASCE 5, in structures classified as structural occupancy category IV, in accordance with Table 1604.5, and masonry in buildings more than three stories in height, shall comply with Table 1704.5.3.

**Exception:** Alterations to existing masonry walls where the quantity of masonry involved in any one given location does not exceed 50 contiguous square feet (4.64 m<sup>2</sup>) shall be permitted to be subject to level 1 special inspection in accordance with Table 1704.5.1 when specifically identified as such on the approved construction documents by the registered design professional of record.

**TABLE 1704.5.3  
LEVEL 2 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCE FOR CRITERIA		
			BC Section	TMS 402/ACI 530/ASCE 5 <sup>a</sup>	TMS 602/ACI 530.1/ASCE 6 <sup>a</sup>
1. Compliance with required inspection provisions of the construction documents and the approved submittals.	—	X	—	—	Art. 1.5
2. Verification of $f'_m$ and $f'_{AAC}$ prior to construction and for every 5,000 square feet during construction.	—	X	—	—	Art. 1.4B
3. Verification of proportions of materials in premixed or preblended mortar and grout as delivered to the site.	—	X	—	—	Art. 1.5B
4. Verification of slump flow and VSI as delivered to the site for self-consolidating grout.	X	—	—	—	Art. 1.5B.1.b.3
5. The following shall be verified to ensure compliance:					
a. Proportions of site-prepared mortar, grout and prestressing grout for bonded tendons.	—	X	—	—	Art. 2.6A
b. Placement of masonry units and construction of mortar joints.	—	X	—	—	Art. 3.3B
c. Placement of reinforcement, connectors and prestressing tendons and anchorages.	—	X	—	Sec. 1.15	Art. 3.4, 3.6A
d. Grout space prior to grout.	X	—	—	—	Art. 3.2D
e. Placement of grout.	X	—	—	—	Art. 3.5
f. Placement of prestressing grout.	X	—	—	—	Art. 3.6C
g. Size and location of structural elements.	—	X	—	—	Art. 3.3F
h. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.	X	—	—	Sec. 1.2.2(e), 1.16.1	—
i. Specified size, grade and type of reinforcement, anchor bolts, prestressing tendons and anchorages.	—	X	—	Sec. 1.15	Art. 2.4, 3.4
j. Welding of reinforcing bars.	X	—	—	Sec. 2.1.9.7.2, 3.3.3.4(b)	—
k. Preparation, construction and protection of masonry during cold weather (temperature below 40°F) or hot weather (temperature above 90°F).	—	X	Sec. 2104.3, 2104.4	—	Art. 1.8C, 1.8D
l. Application and measurement of prestressing force.	X	—	—	—	Art. 3.6B
6. Preparation of any required grout specimens and/or prisms shall be observed.	X	—	Sec. 2105.2.2, 2105.3	—	Art. 1.4

For SI: °C = [(°F) - 32]/1.8, 1 square foot = 0.0929m<sup>2</sup>.

a. The specific standards referenced are those listed in Chapter 35.



**1704.6 Wood construction.** Special inspections of the fabrication process of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2. Special inspections of site-built assemblies shall be in accordance with Section 1704.1.

**1704.6.1 High-load diaphragms.** High-load diaphragms designed in accordance with Table 2306.2.1(2) shall be installed with special inspections as indicated in Section 1704.1. The special inspector shall inspect the wood structural panel sheathing to ascertain whether it is of the grade and thickness shown on the approved construction documents. Additionally, the special inspector must verify the nominal size of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agrees with the approved construction documents.

**1704.6.2 Metal-plate-connected wood trusses.** In addition to the requirements of Section 1704.1, metal-plate-connected wood trusses shall be subject to special inspection in accordance with Section 1704.6.2.1 and 1704.6.2.2.

**1704.6.2.1 Erection.** The use of all metal-plate-connected wood trusses shall be subject to special inspection for compliance with the approved construction documents, the requirements of Sections 1704.1, and the following:

1. All installed materials shall be clean, straight and otherwise undamaged. Members and parts shall not be stretched, bent, or otherwise distorted unless such forming is in the integral part of the design. The special inspector shall ensure that damaged members are not used for construction.
2. Profiles of members used structurally shall conform to the dimensions specified in the approved construction documents. The installation shall be inspected for compliance with the approved construction documents regarding locations, positions, beam separators, bearing surfaces, fasteners, screws, bolts and bracing, as applicable.
3. Temporary bracing, shoring, jacks, etc., shall not be removed until the special inspector determines that they are no longer needed.
4. Where prefabricated metal-plate-connected wood trusses are utilized, such prefabricated wood structural elements and assemblies shall also comply with Section 1704.2. Where any metal-plate connectors are utilized in site-built assemblies, such connections and assemblies shall be subject to special inspection for compliance with the requirements of the approved construction documents and manufacturers' instructions.

**1704.6.2.2 Metal-plate-connected wood trusses spanning 60 feet or greater.** Where a truss clear span is 60 feet (18 288 mm) or greater, the special inspector shall verify that the temporary installation restraint/

bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

**1704.6.3 Prefabricated wood I-joists.** The fabrication of prefabricated wood I-joists shall be subject to special inspections in accordance with Section 1704.2 and the requirements of Section 2303.1.2.

**1704.6.3.1 Erection.** The erection of prefabricated wood I-joists shall be subject to special inspection for compliance with the approved construction documents, the requirements of Sections 1704.1, and the following:

1. All installed materials shall be clean, straight and otherwise undamaged. Members and parts shall not be stretched, bent, or otherwise distorted unless such forming is in the integral part of the design. The special inspector shall ensure that damaged members are not used for construction.
2. Profiles of members used structurally shall conform to the dimensions specified in the approved construction documents. The installation shall be inspected for compliance with the approved construction documents regarding locations, positions, beam separators, bearing surfaces, fasteners, screws, bolts and bracing, as applicable.
3. The size, location, and number of penetrations shall be inspected for compliance with the approved construction documents and manufacturers' instructions.
4. Temporary bracing, shoring, jacks, etc., shall not be removed until the special inspector determines that they are no longer needed.

**1704.6.4 Other structural wood construction.** All other structural wood construction shall be subject to progress inspections for the structural frame to the extent required by Section 110.3.3.

**1704.7 Subsurface conditions.** The special inspections for existing subsurface conditions, fill placement and load-bearing requirements shall be performed in accordance with Sections 1704.7.1 through 1704.7.3. The approved geotechnical report, required by Section 1802.2, shall be used to determine compliance.

**1704.7.1 Subgrade inspection.** Immediately prior to placement of the footings, foundations, fill or other supporting materials the special inspector shall determine that the site has been prepared and is in accordance with the approved geotechnical report.

**1704.7.2 During fill placement.** During placement and compaction of the fill material, the special inspector shall determine that the material being used and the maximum lift thickness comply with the approved geotechnical report, as specified in Section 1803.5.

**1704.7.3 Evaluation of in-place density.** The special inspector shall determine, at the approved frequency, that

the in-place dry density of the compacted fill complies with the approved geotechnical report.

**1704.7.4 Special inspection of subsurface investigations, borings and test pits.** Boring and test pit operations shall be subject to continuous special inspection to verify compliance with Section 1802. Soil sample recovery operations for test pits shall be subject to continuous special inspection to verify compliance with Section 1802.

**Exception:** Existing boring, test pit and subsurface investigation records that have been deemed acceptable to the commissioner in accordance with Section 1802.4.2 are not subject to special inspection.

**1704.7.4.1 Boring and/or test pit report.** The special inspector shall prepare a written report that includes statements attesting to the following: that borings were performed in accordance with the procedures established in Section 1802.5, that 100 percent of the borings and test pits were witnessed directly by the designated special inspection agency, the identification of those borings, the name of the individual special inspectors that witnessed the borings and/or test pits; confirmation that the borings and/or test pits were made and carried to the depths indicated; that to the best of the special inspector's knowledge and belief, the description and classification of the soils are a true description of the samples recovered from the respective borings and/or test pits; that such samples were recovered at the levels indicated; and that the boring and/or test pit work progressed in such manner that the samples recovered are reasonably representative of the subsurface conditions.

**1704.8 Deep foundation elements.** The installation of deep foundation elements shall be subject to special inspections. A special inspector shall be present continuously during the installation of each deep foundation element, and also shall be present continuously for all required testing of deep foundation elements. The special inspection agency shall submit to the commissioner records of the installation of each deep foundation element, and where testing is required, the special inspection agency shall also submit records of the testing.

**1704.8.1 Records of deep foundation element installation.** The record of installation of each deep foundation element shall include, but not be limited to, the following:

1. The identifying designation of the deep foundation element and the date of installation, including the start and end times.
2. The size, material, and allowable capacity as specified in the contract drawings.
3. The elevation of the minimum required depth of penetration, and the final tip elevation and butt elevation.
4. For driven piles, record the type and size of hammer and record the number of blows per foot of penetration from the start of driving until the final blow count required by the contract drawings is reached.
5. For driven or drilled piles filled with concrete or grout:

5.1. Prior to placing concrete, inspect the inside of the pile for alignment and damage. Record the results of the inspection, noting whether or not the pile is in compliance with Sections 1808, 1809, and 1810, and contract requirements.

5.2. Witness the placement of concrete or grout inside the deep foundation element, and record the volume placed. Note the date and time of placement, and whether or not the concrete or grout was placed in compliance with Sections 1808, 1809, and 1810, and contract requirements.

6. For drilled or vibrated deep foundation elements, record the equipment and method used for installation and record the time for each foot of penetration from the start of installation until completion.

7. For deep foundation elements requiring a rock socket:

7.1. Record the equipment and method of drilling the rock socket. Record the top elevation and bottom elevation of the rock socket, as well as the time for each foot of drilling the rock socket.

7.2. Inspect the rock socket as required by contract drawings. Record the results of the inspection and note whether or not the rock socket complies with the requirements of Sections 1808, 1809, and 1810, and the contract requirements.

8. Record the elevation of splices and note whether or not the splices were installed and located in compliance with the requirements of Sections 1808, 1809, and 1810, and the contract requirements.

9. For methods of deep foundation element installation not covered by Items 1 through 8 above, perform additional inspection as required by the contract drawings and record the results noting whether or not the deep foundation elements comply with the requirements of Sections 1808, 1809, and 1810, and the contract requirements.

**1704.8.2 Records of testing of deep foundations elements.** The records of testing of deep foundation elements shall include but not be limited to the following:

1. For load test requiring a load or reaction frame, inspect the construction of the load or reaction frame. Record the results of the inspection and note whether or not the frame complies with the design drawings for the frame signed and sealed by a registered design professional.
2. The identifying designation for the element being tested, and the date of the testing, including the start and end time.
3. Record the method of performing the test, including the equipment being used, as well as the test results, noting whether or not the method of testing and the test results comply with the requirements of Sec-

tions 1808, 1809, and 1810, and the contract requirements.

**1704.8.3 Additional inspection.** For steel elements, perform additional inspections in accordance with Section 1704.3. For concrete or grout, and concrete or grout filled elements, perform additional inspection in accordance with Section 1704.4.

**1704.8.4 Submittal of records of installation and testing.** The special inspector's submittal of installation records for each deep foundation element, and testing records when required, shall include the following:

1. A location plan showing the designation identifying each deep foundation element, and the location of required testing.
2. A written summary of the installation and testing performed, signed by the special inspector, including a statement verifying that all installation and testing complies with the requirements of Sections 1808, 1809, and 1810, and the contract requirements.

**1704.8.5 Helical pile foundations.** Special inspections shall be performed continuously during installation of helical pile foundations. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by the registered design professional of record. The approved geotechnical report and the construction documents prepared by the registered design professional and standards established by the commissioner pursuant to Section 28-113.2.2 of the *Administrative Code* shall be used to determine compliance.

**1704.9 Vertical masonry foundation elements.** Special inspection shall be performed in accordance with Section 1704.5 for vertical masonry foundation elements.

**Exception:** Piers for support of lightweight fences, recreational equipment, site furnishings and similar construction, unless special inspection is specifically noted as required on the approved construction documents.

**1704.10 Wall panels, curtain walls and veneers.** Special inspection is required for exterior architectural wall panels and the anchoring of veneers designed for installation on buildings above a height of 40 feet (12 192 mm). Special inspection of masonry veneer on such structures shall be in accordance with Section 1704.5.

**Exceptions:** Special inspection of wall panels, curtain walls and veneers is not applicable to:

1. Repairs and replacement in kind of gaskets or seals; or
2. Reglazing other than 4-sided structural silicone glazing.

**1704.10.1 Design and installation documents.** The special inspector shall become familiar with and retain a copy of the approved construction documents, and the following items, as applicable, approved by the registered design professional of record:

1. Shop drawings.†
2. Instructions for the sequence of component installation.†
3. Samples and/or mock-ups, if supplied.

**1704.10.2 Inspection program.** The special inspector shall field check the site conditions at the time the structure is prepared for component installation, and periodically during component installation, to verify the following work is performed in compliance with the approved construction documents, including that:

1. The supporting structure for components being installed is aligned and within specified tolerances required for the components;
2. Required inserts are installed;
3. Framing components are ‡installed and aligned as specified, and without structural defects or weakness;
4. Anchors are placed, welded, bolted and finished as specified, as applicable;
5. Weeps, flashings and tubes are installed as specified and functioning;
6. Joinery and end dams are sealed as specified;‡
7. Sealing materials with specified adhesive and movement capabilities are installed;
8. Gaskets, tapes, seals, insulation, flashing and other materials that are barriers to air and water movement, vapor drive, and heat loss are installed as specified;
9. Joint filler materials that‡ accommodate specified horizontal and vertical movement are installed in accordance with the manufacturers' instructions; and
10. Any other observations pertinent to safety of performance of the wall system.

**1704.11 Sprayed fire-resistant materials.** Special inspections for sprayed fire-resistant materials applied to floor, roof and wall assemblies and structural members shall be in accordance with Sections 1704.11.1 through 1704.11.7. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents. The tests set forth in this section shall be based on samplings from specific floor, roof and wall assemblies and structural members. Special inspections shall be performed after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems and suspension systems for ceilings, where applicable.

**1704.11.1 Physical and visual tests.** The special inspections shall include the following tests and observations to demonstrate compliance with the listing and the fire-resistance rating:

1. Condition of substrates.
2. Thickness of application.
3. Density in pounds per cubic foot (kg/m³).



4. Bond strength adhesion/cohesion.

5. Condition of finished application.

‡1704.11.2 **Structural member surface conditions.** The surfaces shall be prepared in accordance with the approved fire-resistance design and the written instructions of approved manufacturers. The prepared surface of structural members to be sprayed shall be inspected before the application of the sprayed fire-resistant material.

1704.11.3 **Application.** The substrate shall have a minimum ambient temperature before and after application as specified in the written instructions of approved manufacturers. The area for application shall be ventilated during and after application as required by the written instructions of approved manufacturers.

1704.11.4 **Thickness.** The thickness of the sprayed fire-resistant materials shall comply with the following:

1. No more than 10 percent of the thickness measurements of the sprayed fire-resistant materials applied to floor, roof and wall assemblies and structural members shall be less than the thickness required by the approved fire-resistance design‡;
2. In no case shall the thickness be less than the minimum allowable thickness required by Section 1704.11.4.1.

1704.11.4.1 **Minimum allowable thickness.** For design thicknesses 1 inch (25 mm) or greater, the minimum allowable individual thickness shall be the design thickness minus  $\frac{1}{4}$  inch (6.4 mm). For design thicknesses less than 1 inch (25 mm), the minimum allowable individual thickness shall be the design thickness minus 25 percent. Thickness shall be determined in accordance with ASTM E 605. Samples of the sprayed fire-resistant materials shall be selected in accordance with Sections 1704.11.4.2 and 1704.11.4.3.

1704.11.4.2 **Floor, roof and wall assemblies.** The thickness of the sprayed fire-resistant material applied to floor, roof and wall assemblies shall be determined in accordance with ASTM E 605, making not less than four measurements for each 1,000 square feet (93 m<sup>2</sup>) of the sprayed area in each story or portion thereof.

1704.11.4.2.1 **Cellular decks.** Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. A minimum of four measurements shall be made, located symmetrically within the square area.

1704.11.4.2.2 **Fluted decks.** Thickness measurements shall be selected from a square area, 12 inches by 12 inches (305 mm by 305 mm) in size. A minimum of four measurements shall be made, located symmetrically within the square area, including one each of the following: valley, crest and sides. The average of the measurements shall be reported.

1704.11.4.3 **Structural framing members.** The thickness of the sprayed fire-resistant material applied to

structural members shall be determined in accordance with ASTM E 605. Thickness testing shall be performed on not less than 25 percent of the structural members on each floor.

1704.11.4.3.1 **Beams and girders.** At beams and girders thickness measurements shall be made at nine locations around the beam or girder at each end of a 12-inch (305 mm) length.

1704.12.4.3.2 **Joists and trusses.** At joists and trusses, thickness measurements shall be made at seven locations around the joist or truss at each end of a 12-inch (305 mm) length.

1704.11.4.3.3 **Wide-flanged columns.** At wide-flanged columns, thickness measurements shall be made at 12 locations around the column at each end of a 12-inch (305 mm) length.

1704.11.4.3.4 **Hollow structural section and pipe columns.** At hollow structural section and pipe columns, thickness measurements shall be made at a minimum of four locations around the column at each end of a 12-inch (305 mm) length.

1704.11.5 **Density.** The density of the sprayed fire-resistant material shall not be less than the density specified in the approved fire-resistance design. Density of the sprayed fire-resistant material shall be determined in accordance with ASTM E 605. The test samples for determining the density of the sprayed fire-resistant materials shall be selected as follows:

1. From each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m<sup>2</sup>) or portion thereof of the sprayed area in each story.
2. From beams, girders, trusses and columns at the rate of not less than one sample for each type of structural member for each 2,500 square feet (232 m<sup>2</sup>) of floor area or portion thereof in each story.

1704.11.6 **Bond strength.** The cohesive/adhesive bond strength of the cured sprayed fire-resistant material applied to floor, roof and wall assemblies and structural members shall not be less than 150 pounds per square foot (psf) (7.18 kN/m<sup>2</sup>). The cohesive/adhesive bond strength shall be determined in accordance with the field test specified in ASTM E 736 by testing in-place samples of the sprayed fire-resistant material selected in accordance with Sections 1704.11.6.1 through 1704.11.6.3.

1704.11.6.1 **Floor, roof and wall assemblies.** The test samples for determining the cohesive/adhesive bond strength of the sprayed fire-resistant materials shall be selected from each floor, roof and wall assembly at the rate of not less than one sample for every 2,500 square feet (232 m<sup>2</sup>) or part thereof of the sprayed area in each story.

1704.11.6.2 **Structural members.** The test samples for determining the cohesive/adhesive bond strength of the sprayed fire-resistant materials shall be selected from beams, girders, joists, trusses, columns and other structural members at the rate of not less than one sam-

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ple for each type of structural member for each 2,500 square feet (232 m<sup>2</sup>) of floor area or portion thereof in each story.

**1704.11.6.3 Primer, paint and encapsulant bond tests.** Bond tests to qualify a primer, paint or encapsulant shall be conducted when the sprayed fire-resistant material is applied to a primed, painted or encapsulated surface for which acceptable bond-strength performance between these coatings and the fire-resistant material has not been determined. A bonding agent approved by the SFRM manufacturer shall be applied to a primed, painted or encapsulated surface where the bond strengths are found to be less than required values.

**1704.11.7 Inspection of existing sprayed fire-resistant materials during alterations in office spaces and spaces classified in Occupancy Group B.** In office spaces and spaces classified in Occupancy Group B, where an alteration exposes any required sprayed fire-resistant materials on structural members or where, pursuant to an alteration, persons are required to enter or access areas in which such sprayed fire-resistant materials are capable of being observed, the existing required sprayed fire-resistant materials shall be subject to special inspection. Such inspection shall require a determination, based on visual inspection, (i) that the existing sprayed fire-resistant materials as originally applied or installed comply with the applicable requirements of this code, including those for installation methods, materials, thickness and coverage; and (ii) that, since their original application, the integrity of the existing sprayed fire-resistant materials has not been compromised, damaged or displaced by the current alteration or by any prior alteration or other event.

**1704.12 Mastic and intumescent fire-resistant coatings.** Special inspections for mastic and intumescent fire-resistant coatings applied to structural elements and decks shall be in accordance with AWCI 12-B. Special inspections shall be based on the fire-resistance design as designated in the approved construction documents.

**1704.13 Exterior insulation and finish systems (EIFS).** Special inspections shall be required for all EIFS applications installed more than 15 feet (4572 mm) above adjacent finished grades and alterations to existing EIFS installations more than 15 feet (4572 mm) above adjacent finished grades.

**1704.13.1** The special inspection shall include verification of: compliance with approved construction documents for attachment to structure, installation of waterproofing membranes, weeps, drains, mold prevention features and conformance with the manufacturers' installation guidelines.

**1704.13.2 Water-resistive barrier coating.** A water-resistive barrier coating complying with ASTM E 2570 requires special inspection of the water-resistive barrier coating when installed over a sheathing substrate.

**1704.14 Special cases.** Special inspections shall be required for proposed work that is, in the opinion of the commissioner, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

**1704.14.1 Qualifications.** Where special inspections are required for proposed work in accordance with Section 1704.14, the special inspection shall be performed by special inspectors qualified to inspect the work to be inspected. The qualifications of the special inspector shall be acceptable to the commissioner.

**1704.15 Special inspection for smoke control.** Smoke control systems shall be tested by a special inspector in accordance with Sections 1704.15.1 and 909.

**Exception:** Post-fire smoke purge systems that are not required to function as a smoke control system shall be permitted to be inspected pursuant to the special inspection requirements of Section 1704.16.

**1704.15.1 Testing scope.** The test scope shall be as follows:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.
2. Prior to occupancy and after sufficient completion for the purposes of pressure difference testing, flow measurements and detection and control verification.

**1704.15.2 Qualifications.** Special inspection agencies for smoke control shall have expertise in fire protection engineering and mechanical engineering and certification as air balancers.

**1704.16 Special inspection for mechanical systems.** Mechanical systems regulated which require a certificate of compliance in accordance with Section 28-116.4.1 of the *Administrative Code* shall be inspected for conformance with the approved construction documents.

**1704.16.1 Tests for mechanical systems.** Tests of mechanical systems shall be performed in accordance with Sections 507.16, 1011, 1108 and 1208 of the *New York City Mechanical Code*.

**Exception:** Listed and labeled self-contained factory-built equipment and appliances deemed to meet the design, manufacture and factory test requirements of this code shall be field tested in accordance with the manufacturers' installation and operational test standards.

**1704.16.2 Special inspection of mechanical systems.** Inspections of mechanical systems shall include the following as applicable to the system:

1. Visual certification that required components of such systems are complete in accordance with the manufacturers' installation guidelines and the approved construction documents;
2. Supports, hangers, and vibration isolation equipment are properly spaced and anchored to supporting structure;
  - 2.1. Seismic bracing shall be inspected in accordance with Section 1707.7.†
3. Installation of required signage and safety instructions;
4. Electrical components are installed and electrical sign-off issued;
5. Ventilation balancing report is complete and in accordance with design documents and the system is operating as designed;
6. Required labeling, operational instructions and safety signage properly posted;
7. All related special inspections for such systems are complete;
8. The installation of exterior mechanical equipment for compliance with the approved construction documents, including, as applicable:
  - 8.1. Equipment specified;
  - 8.2. Equipment location;
  - 8.3. Installation and attachment details;
  - 8.4. Vibration isolation installation; and
  - 8.5. Other items specified by the applicant of record for the mechanical equipment design necessary to verify compliance with Section 928.2.1 of the *New York City Mechanical Code*.
9. Required fire and smoke dampers are installed and functioning properly.

**1704.17 Special inspection for fuel storage and fuel-piping systems.** Fuel-oil storage equipment, including tanks, pumps, valves, transfer, return, fill and vent piping, hangers and bracing, fill and vent terminals, and related systems regulated by Section 1308 of the *New York City Mechanical Code*, shall be inspected for conformance with the approved construction documents and the manufacturers' installation standards. Testing of fuel storage tanks and piping shall be performed in accordance with Section 1308 of the *New York City Mechanical Code*. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**Exceptions:**

1. Testing for listed fuel oil storage tanks 660 gallons (2498 L) or less in capacity, supplied with a label or manufacturer's certification attesting that the tank was factory tested to a testing standard indicated in Section 1308.1 of the *New York City Mechanical Code*.

2. Systems and equipment exempt from service equipment certificate of compliance in accordance with Section 28-116.4.1 of the *Administrative Code*.

**1704.18 High-pressure-steam piping and high temperature hot water piping.** High-pressure-steam piping and high temperature hot water piping regulated by Section 1210 of the *New York City Mechanical Code*, shall be subject to special inspection in accordance with this section. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**1704.18.1 Welding.** The special inspector shall verify the qualifications of the welder and the quality of the welding materials and equipment prior to welding operations. The special inspector shall review the proposed welding procedures for compliance with applicable standards listed in Section 1210.2.2 of the *New York City Mechanical Code*.

**1704.18.2 Welding operations.** The special inspector shall perform periodic inspection of the pipe joining and welding operations in accordance with the above. Radiographic testing shall be applied to connections as indicated in Section 1210.2.2 of the *New York City Mechanical Code*. Unacceptable connections and installations shall be rejected.

**1704.18.3 Testing of high-pressure-steam systems and high temperature hot water piping systems.** Hydrostatic testing shall be performed on the completed installation of new and altered systems in accordance with Section 1210.2.3 of the *New York City Mechanical Code*.

**Exception:** Testing requirements shall not apply to alteration or repairs to existing piping systems in which the integrity of the piping is not affected. Such alterations shall be visually inspected for compliance with the approved construction documents.

**1704.19 High-pressure-gas piping.** High-pressure-gas piping regulated in Section 406 of the *New York City Fuel Gas Code* shall be subject to special inspection in accordance with this section. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**1704.19.1 Welding.** The special inspector shall verify the qualifications of the welder, the quality of the welding materials and equipment prior to welding operations. The special inspector shall review the proposed welding procedures for compliance with applicable standards listed in Section 406 of the *New York City Fuel Gas Code*.

**1704.19.2 Welding operations.** The special inspector shall perform periodic special inspection for the pipe joining and welding operations in accordance with the above. Radiographic testing shall be performed to the connections as indicated in Section 406.4 of the *New York City Fuel Gas Code*.

**1704.19.3 Testing of high-pressure-gas piping.** Pressure testing shall be performed on the completed installation of new and altered systems in accordance with Section 406.4 of the *New York City Fuel Gas Code*.

**1704.20 Structural stability.** Special inspection for structural stability shall be required for construction work as specified in this section or elsewhere in this code. Structural

materials and methods of construction utilized in temporary protections shall be subject to special inspection when such materials and methods of construction would be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including but not limited to special inspection for concrete, welding, and pile driving.

**Exception:** Alterations consisting of the replacement of existing exterior window or door lintels located less than 75 feet (22 860 mm) above curb level spanning less than 4 feet (1219 mm) and existing interior headers spanning less than 4 feet (1219 mm), provided the size of the existing span is not increased, shall be exempt from special inspection for structural stability.

#### 1704.20.1 Structural stability of existing buildings.

Alterations to existing structures in which loads are transferred from one structural system of structural elements to another, such as installation of columns or girders, replacement of existing bearing walls, the creation of openings or slots in existing walls, girders or floors, alteration of arches, rigid frames, trusses in frame buildings, where the stability or integrity of a structural system is to be temporarily diminished, or where otherwise required by the commissioner, shall be subject to special inspections in accordance with Sections 1704.20.6 through 1704.20.10.

**1704.20.1.1 Construction operations influencing adjacent structures.** Where construction operations have the potential to affect structurally the condition or occupancy of the subject structure and/or an adjacent structure, the structural stability of such structures shall be subject to special inspections in accordance with Sections 1704.20.6 through 1704.20.10.

**1704.20.2 Excavations.** Methods employed to protect the sides of excavations meeting the requirements of Item 1 of Section 3304.4.1 shall be subject to special inspections in accordance with Sections 1704.20.6 through 1704.20.10.

**1704.20.2.1 Slurry.** The proportions and installation of slurry mixtures to protect the sides of excavations shall be subject to special inspection. Slurry mix proportions and installation procedures shall be provided by a registered design professional, and the special inspection agency shall verify compliance with the approved procedures.

**1704.20.3 Underpinning.** Underpinning of structures shall be subject to special inspections in accordance with Sections 1704.20.6 through 1704.20.10.

**1704.20.3.1 New foundations.** In addition to the special inspection for structural stability, any new foundation elements installed as part of underpinning operations shall be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including, but not limited to, special inspection for concrete, welding, and pile driving.

**1704.20.4 Demolition.** Where mechanical demolition equipment, other than handheld devices, is to be used in the full or partial demolition of a building from within the building, or is to be used within the building to remove

debris or move material, such demolition operation shall be subject to special inspection in accordance with Sections 1704.20.6 through 1704.20.10. The special inspector shall visit the site a minimum of three times: before demolition operations start, during demolition, and at the conclusion of demolition.

**1704.20.5 Raising and moving of a building.** A periodic special inspection shall be required in accordance with Sections 1704.20.6 through 1704.20.10 where the lowest above-grade floor or the lowest subgrade floor of a building is to be raised, lifted, elevated or moved.

**1704.20.6 Inspection program.** Prior to commencement of work, the special inspector shall review the contractor's proposed sequence of operations and determine the areas of work that require design. A written statement shall be prepared, mutually acceptable to the contractor and the special inspector, indicating:

1. The portions of work requiring design documents in accordance with Section 1704.20.7.
2. The names and addresses of the licensed professionals that have been engaged to supply design documents for applicable work.
3. The approximate dates for delivery of design documents.
4. A schedule of periodic special inspections, at agreed intervals, including adequate frequency to assure the contractor's continued compliance with the proposed designs and sequence of construction operations. At a minimum, the site must be inspected twice, once at a pre-construction meeting with the contractor and once during construction operations.

**1704.20.7 Design documents.** Design documents, including shop drawings, sketches and written descriptions of proposed work regarding structural stability in construction operations shall be prepared by a registered design professional in the employ of the owner or the contractor. Such designs may be revised at any time by the registered design professional. Copies of the special inspection log book, the design documents and revisions thereof, shall be maintained at the job site, and at the office of the special inspector, available for use and review at all reasonable times, until the work subject to special inspection is complete. In the case of alteration to existing structures, the structural stability design documents shall be reviewed by the registered design professional of record.

**1704.20.7.1 Monitoring.** The design documents shall include any requirements for monitoring of the subject structure and/or adjacent structures, as determined by the registered design professional responsible for the design. The monitoring plan shall be specific to the buildings to be monitored and operations to be undertaken, and shall specify the scope and frequency of monitoring, acceptable tolerances, and reporting criteria for when tolerances are exceeded.

**1704.20.8 Inspection during construction operations.** The special inspector shall visit the jobsite at agreed inter-



vals, assess the ongoing work and verify that operations conform with the design documents. Deficiencies shall be reported as required by Section 1704.1.2. In the event unsafe conditions are discovered, the commissioner and the registered design professional employed by the contractor shall be immediately notified by the special inspector.

**1704.20.9 Records of special inspections.** The special inspection logbook shall be maintained at the special inspector's office and shall contain the following information:

1. Project identification, application number and address.
2. Date and time of each inspection.
3. Names of personnel who performed each inspection.
4. Dates of off-site meetings, names of the participants and a summary of the conversations.
5. Any significant observations or instructions given related to any of the following:
  - 5.1. Deviations from the design documents.
  - 5.2. Anticipated field conditions.
  - 5.3. Proper execution of the work.
  - 5.4. Safe jobsite conditions.
  - 5.5. Precautions taken to maintain safe conditions, if work is stopped for any reason.

**1704.20.10 Special requirements for work in occupied multiple dwellings.** When alteration or construction operations are performed at occupied multiple dwellings, the special inspector shall periodically verify compliance with a tenant protection plan as provided for in Chapter 1 of Title 28 of the *Administrative Code*.

**1704.21 Private on-site storm water disposal systems and detention facilities.** Storm water detention and retention systems required to comply with Section 1114 of the *New York City Plumbing Code*, and roof detention facilities shall be inspected for compliance with the provisions of this section.

**1704.21.1 Subsurface investigation special inspection.** Soil borings, testpits and soil percolation testing shall be subject to the special inspection requirements of this section.

**1704.21.1.1 Soil borings and testpits.** Prior to the approval of construction documents, soil borings and testpits shall be performed in accordance with the provisions of Section 1114.2.1 of the *New York City Plumbing Code*. Soil borings and testpits shall be performed under the supervision of a special inspector. The results of the soil borings and testpits shall be filed on forms provided by the department.

**1704.21.1.2 Soil percolation tests.** Prior to the approval of construction documents, soil percolation tests shall be performed in accordance with the provisions of Section 1114.2.2 of the *New York City Plumbing Code* at the site of a proposed on-site stormwater drainage and detention facility installation to determine the suitability of the soil and site. Such test shall

be performed under the supervision of a special inspector. The results of the percolation tests shall be filed on forms provided by the department, stating the suitability of the site and the capacity of the subsoil for the proposed use. The registered design professional of record for the dry-well system shall be notified immediately if the results of the percolation test demonstrate that the system may not function as designed.

**1704.21.2 Installation special inspection.** Private on-site stormwater disposal systems and detention facilities shall be inspected for conformance with the approved construction documents. Minor variations, based on actual site conditions, shall be acceptable at the discretion of the registered design professional of record. Verification shall include:

1. Materials of construction.
2. Bedding of pipe and facilities.
3. Placement and installation of fill materials.
4. Volume of drywell and detention facilities.
5. Installation of volume flow control devices.
6. Workmanship and quality of installation.
7. Overall conformance with the approved construction documents.
8. Detention tanks, and roofs used for stormwater detention, shall be filled with water to demonstrate water tightness for a 2-hour duration or as specified by the registered design professional or the manufacturer's specifications.

**1704.22 Individual on-site private sewage disposal systems.** Individual on-site private sewage disposal systems shall be inspected in accordance with the rules of the department.

**1704.23 Sprinkler system special inspection.** New and altered sprinkler system shall be inspected in accordance with Sections 903 and 1704.23.1. The permit holder responsible for the sprinkler work shall perform all required acceptance tests, complete and sign the appropriate contractor's material and test certifications. The special inspector shall witness all required tests and shall verify that all installations of all materials, fittings, hangers, assemblies and signage are in accordance with the approved construction documents, that painting of the sprinkler system required by Section 903.6 of this code has been performed and that the contractor has transmitted required maintenance literature and instruction to the owner. The special inspector shall verify that the material and test certification forms have been transmitted to the Fire Department and the Department of Buildings. Seismic bracing shall be inspected in accordance with Section 1707.7.

**Exception:** The special inspection agency need not witness the hydrostatic pressure test when such test is witnessed by the department.

**1704.23.1 Hydrostatic pressure testing.** All new or altered sprinkler systems in buildings shall undergo successful hydrostatic pressure testing by a licensed master plumber or licensed fire suppression piping contractor in



accordance with the requirements of this code, including Section 901.5, and NFPA 13.

**1704.24 Standpipe system special inspection.** New and altered standpipe systems shall be inspected in accordance with Sections 905 and 1704.24.1. The permit holder responsible for the standpipe work shall perform all required acceptance tests, and complete and sign the appropriate contractor's material and test certifications. The special inspector shall witness all required tests, verify that installation of all materials, fittings, hangers, assemblies and signage are in accordance with the approved construction documents, that painting of the standpipe system required by Section 905.11 of this code has been performed and that the contractor has transmitted required maintenance literature and instruction to the owner. The special inspector shall verify that the material and test certification forms have been transmitted to the Fire Department and the Department of Buildings. Seismic bracing shall be inspected in accordance with Section 1707.7.

**Exception:** The special inspection agency need not witness the hydrostatic pressure test shall not be required when such test is witnessed by the department.

**1704.24.1 Hydrostatic pressure testing.** All new or altered standpipe systems in buildings shall undergo successful hydrostatic pressure testing by a licensed master plumber or licensed fire suppression piping contractor in accordance with the requirements of this code, including Section 901.5, Sections 1704.24.1.1† through 1704.24.1.5† and NFPA 14.

**Exception:** When the standpipe system is exposed to freezing conditions, a hydrostatic pressure test required by this section may be postponed until such conditions no longer exist, notwithstanding any requirement that the standpipe be maintained in a state of readiness, provided that the system undergoes an interim test with dry nitrogen or air using a compressor in accordance with NFPA 14. Any such air pressure tests shall be witnessed by the special inspector unless witnessed by the department.

**1704.24.1.1 New buildings under construction.** For standpipes required to comply with Section 3303.8 of this code, an initial hydrostatic pressure test of the entire system shall be performed when the building reaches a height of 75 feet (22 860 mm) and additional successful hydrostatic pressure tests of the entire system shall be performed at 175 feet (53 340 mm), and at every 100 feet (30 480 mm) in height thereafter. The permit holder shall perform a final acceptance test of the completed system in accordance with the requirements of Section 901.5 of this code.

**1704.24.1.2 Enlargements or additions to existing system.** Where there is an enlargement that triggers a new standpipe system or there is an addition to an existing standpipe system, hydrostatic pressure tests of the entire system shall be performed for every 75 feet (22 860 mm) of additional height added to the system. The permit holder shall perform a final acceptance test

of the completed system in accordance with the requirements of Section 901.5 of this code.

**1704.24.1.3 Removal of stories, including full demolitions.** Where stories are removed from a building served by an existing standpipe system, hydrostatic pressure tests of the entire system shall be performed prior to the commencement of work.

**1704.24.1.4 Alterations.** For alterations not covered under Sections 1704.24.1.2 or 1704.24.1.3 above, the permit holder shall perform a final acceptance test of the completed system in accordance with the requirements of Section 901.5 of this code.

**1704.24.1.5 Readiness.** No standpipe system shall be considered in readiness until there has been a successful hydrostatic pressure test.

**1704.25 Heating systems.** Special inspection shall be required for new and altered boilers and heating systems. All boilers and heating systems, including chimney connectors, shall be inspected for compliance with the approved construction documents. New heating systems shall be tested in accordance with Section 1011 of the *New York City Mechanical Code*. Alterations to heating systems shall be subjected to applicable tests for the altered portions of the system and to verify its satisfactory operation within the existing system. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**Exception:** Tests and inspections need not duplicate any tests or inspections previously certified by the commissioner or a duly authorized insurance company.

**1704.26 Chimneys.** New and altered chimneys shall be subject to special inspection. The chimney shall be inspected to verify compliance with the approved construction documents, and proper clearance or isolation from adjacent combustible construction. Testing of the chimney shall be performed in accordance with Section 810 of the *New York City Mechanical Code* and Section 503.5.6 of the *New York City Fuel Gas Code*. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**Exception:** A pressurized smoke test need not be performed on an existing negative pressure chimney if the lining of such chimney is not affected by alterations and the registered design professional specifies on the approved construction documents that such test does not need to be performed on such chimney. Refer to Section 810 of the *New York City Mechanical Code* and Section 503.5.6 of the *New York City Fuel Gas Code* for smoke test requirements.

**1704.27 Fire-resistant penetrations and joints.** Special inspections for through-penetrations, membrane penetration firestops, fire-resistant joint systems, and perimeter fire barrier systems that are tested and listed in accordance with Sections 713.4.1.1.2, 713.4.1.2, 714.3 and 714.4 shall comply with Sections 1704.27.1 and 1704.27.2.

**1704.27.1 Penetration firestops.** Inspections of penetration firestop systems that are tested and listed in accordance with Sections 713.4.1.1.2 and 713.4.1.2 shall be

conducted by an approved special inspection agency in accordance with ASTM E 2174.

**1704.27.2 Joint systems.** Inspection of fire-resistant joint systems that are tested and listed in accordance with Sections 714.3 and 714.4 shall be conducted by an approved special inspection agency in accordance with ASTM E 2393.

**1704.28 Aluminum construction.** The special inspections for structural aluminum elements of buildings and structures shall be as required by Section 1704.28.1.

**1704.28.1 Welding operations.** All welding operations of aluminum elements shall be subject to special inspection for compliance with this code, AA ADM, and AWS D1.2.

**Exception:** Welding operations in connections where the calculated stresses in the welds are less than 50 percent of the basic allowable values. Such connections shall be specifically indicated on the approved construction documents.

**1704.29 Flood zone compliance.** Special inspection for flood zone compliance shall be as required by Appendix G of this code.

**1704.30 Photoluminescent exit path markings.** The installation of photoluminescent egress path markings shall be subject to special inspection. The special inspector shall verify that approved photoluminescent egress path markings were provided and installed in accordance with department rules and regulations, the approved construction documents, and manufacturer's instructions.

**1704.31 Emergency and standby power systems (generators).** The installation of generators as part of emergency and standby power systems shall be subject to special inspection. The special inspector shall: perform visual inspections; verify that the installations of all materials, equipment and signage complies with the installation standards; and verify that the installation of the generator and associated connections complies with the approved construction documents. The special inspector shall witness tests that verify the automatic operation of the emergency or standby power system in accordance with NFPA 110 and NFPA 111, as such standards may have been amended by the *New York City Electrical Code* or this code. Deficient results shall be rejected, and deficiencies shall be corrected and successfully retested in the presence of the special inspector prior to sign-off of the emergency or standby power system special inspection. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

tion of the emergency or standby power system in accordance with NFPA 110 and NFPA 111, as such standards may have been amended by the *New York City Electrical Code* or this code. Deficient results shall be rejected, and deficiencies shall be corrected and successfully retested in the presence of the special inspector prior to sign-off of the emergency or standby power system special inspection. Special inspection of seismic bracing shall be performed in accordance with Section 1707.7.

**1704.32 Post-installed anchors.** The installation of post-installed mechanical anchors, adhesive anchors, and screw anchors shall comply with Table 1704.32. The special inspection shall include the verification of compliance with approved construction documents and standards established by the commissioner pursuant to Section 28-113.2.2 of the *Administrative Code*.

#### SECTION BC 1705 RESERVED

#### SECTION BC 1706 RESERVED

#### SECTION BC 1707 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE

**1707.1 Reserved.**

**1707.2 Reserved.**

**1707.3 Reserved.**

**1707.4 Reserved.**

**1707.5 Reserved.**

**1707.6 Reserved.**

**TABLE 1704.32  
REQUIRED VERIFICATION AND INSPECTION OF POST-INSTALLED ANCHORS**

VERIFICATION AND INSPECTION	CONTINUOUS	PERIODIC	REFERENCED STANDARD	BC REFERENCE
1. Preparation, placement, type, size and location of anchors, including other details of anchors, installed in hardened concrete, and installed to hardened concrete and to another construction.	—	X	ACI 318: 3.8.6, 8.1.3, 15.8.3, 21.1.8	1912.1, 1908.1.9
2. Preparation, placement, type, size and location of anchors, including other details of anchors, installed in masonry, and installed to masonry and to another construction.	—	X	Manufacturer's specifications and installation instructions	
3. Preparation, placement, type, size and location of anchors, including other details of anchors, installed in stone, and installed to stone and to another construction.	—	X	Manufacturer's specifications and installation instructions	

NYC 1707.7 **Mechanical, plumbing†, fuel gas, and electrical components.** Special inspection for mechanical, plumbing, fuel gas, and electrical systems and equipment shall be as follows:

1. Periodic special inspection is required during the anchorage of electrical equipment for emergency or standby power systems in structures assigned to Seismic Design Category C or D.
2. Periodic special inspection is required during the installation of piping systems intended to carry flammable, combustible or highly toxic contents and their associated mechanical units in structures assigned to Seismic Design Category C or D.
3. Periodic special inspection is required during the installation of HVAC ductwork that will contain hazardous materials in structures assigned to Seismic Design Category C or D.

NYC 1707.8 **Seismic isolation system.** There shall be periodic special inspection during the fabrication and installation of isolator units and energy dissipation devices if used as part of the seismic isolation system.

#### SECTION BC 1708 RESERVED

#### SECTION BC 1709 RESERVED

#### SECTION BC 1710 RESERVED

#### SECTION BC 1711 DESIGN STRENGTHS OF MATERIALS

NYC 1711.1 **Conformance to standards.** The design strengths and permissible stresses of any structural material that are identified by a manufacturer's designation as to manufacture and grade by mill tests, or the strength and stress grade is otherwise confirmed to the satisfaction of the commissioner shall conform to the specifications and methods of design of accepted engineering practice or the rules of the department in the absence of applicable standards.

NYC 1711.2 **New materials.** For materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests as provided for in Section 1712.

#### SECTION BC 1712 ALTERNATIVE TEST PROCEDURE

NYC 1712.1 **General.** In the absence of rules or other approved standards, and upon special application by a registered design professional the commissioner shall make, or cause to be made, the necessary tests and investigations; or the commissioner shall accept duly authenticated reports from

approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in Article 113 of Chapter 1 of Title 28 of the *Administrative Code*. The cost of all tests and other investigations required under the provisions of this code shall be borne by the permit applicant.

#### SECTION BC 1713 TEST SAFE LOAD

1713.1 **Where required.** Where proposed construction is not capable of being designed by approved engineering analysis, or where proposed construction design method does not comply with the applicable material design standard, the system of construction or the structural unit and the connections shall be subjected to the tests prescribed in Section 1715. The commissioner shall accept certified reports of such tests conducted by an approved testing agency, provided that such tests meet the requirements of this code and approved procedures.

#### SECTION BC 1714 IN-SITU LOAD TESTS

1714.1 **General.** Whenever there is a reasonable doubt as to the stability or load-bearing capacity of a completed building, structure or portion thereof for the expected loads, an engineering assessment shall be required. The engineering assessment shall involve either a structural analysis or an in-situ load test, or both. The structural analysis shall be based on actual material properties and other as-built conditions that affect stability or load-bearing capacity, and shall be conducted in accordance with the applicable design standard. If the structural assessment determines that the load-bearing capacity is less than that required by the code, load tests shall be conducted in accordance with Section 1714.2. If the building, structure or portion thereof is found to have inadequate stability or load-bearing capacity for the expected loads, modifications to ensure structural adequacy or the removal of the inadequate construction shall be required.

1714.2 **Test standards.** Structural components and assemblies shall be tested in accordance with the appropriate material standards listed in Chapter 35. In the absence of a standard that contains an applicable load test procedure, the test procedure shall be developed by a registered design professional and approved. The test procedure shall simulate loads and conditions of application that the completed structure or portion thereof will be subjected to in normal use.

1714.3 **In-situ load tests.** In-situ load tests shall be conducted in accordance with Section 1714.3.1 or 1714.3.2 and shall be supervised by a registered design professional. The test shall simulate the applicable loading conditions specified in Chapter 16 as necessary to address the concerns regarding structural stability of the building, structure or portion thereof.

1714.3.1 **Load test procedure specified.** Where a standard listed in Chapter 35 contains an applicable load test procedure and acceptance criteria, the test procedure and acceptance criteria in the standard shall apply. In the



absence of specific load factors or acceptance criteria, the load factors and acceptance criteria in Section 1714.3.2 shall apply.

**1714.3.2 Load test procedure not specified.** In the absence of applicable load test procedures contained within a standard referenced by this code or acceptance criteria for a specific material or method of construction, such existing structure shall be subjected to a test procedure developed by a registered design professional that simulates applicable loading and deformation conditions. For components that are not a part of the seismic-load-resisting system, the test load shall be equal to two times the unfactored design loads. The test load shall be left in place for a period of 24 hours. The structure shall be considered to have successfully met the test requirements where the following criteria are satisfied:

1. Under the design load, the deflection shall not exceed the limitations specified in Section 1604.3.
2. Within 24 hours after removal of the test load, the structure shall have recovered not less than 75 percent of the maximum deflection.
3. During and immediately after the test, the structure shall not show evidence of failure.

## SECTION BC 1715 PRECONSTRUCTION LOAD TESTS

**1715.1 General.** In evaluating the physical properties of materials and methods of construction that are not capable of being designed by approved engineering analysis or do not comply with applicable material design standards listed in Chapter 35, the structural adequacy shall be predetermined based on the load test criteria established in this section.

**1715.2 Load test procedures specified.** Where specific load test procedures, load factors and acceptance criteria are included in the applicable design standards listed in Chapter 35, such test procedures, load factors and acceptance criteria shall apply. In the absence of specific test procedures, load factors or acceptance criteria, the corresponding provisions in Section 1715.3 shall apply.

**1715.3 Load test procedures not specified.** Where load test procedures are not specified in the applicable design standards listed in Chapter 35, the load-bearing and deformation capacity of structural components and assemblies shall be determined on the basis of a test procedure developed by a registered design professional that simulates applicable loading and deformation conditions. For components and assemblies that are not a part of the seismic-load-resisting system, the test shall be as specified in Section 1715.3.1. Load tests shall simulate the applicable loading conditions specified in Chapter 16.

**1714.5.3.1 Test procedure.** The test assembly shall be subjected to an increasing superimposed load equal to not less than two times the superimposed design load. The test load shall be left in place for a period of 24 hours. The tested assembly shall be considered to have successfully met the test requirements if the assembly recovers not less than 75 percent of the maximum deflection

within 24 hours after the removal of the test load. The test assembly shall then be reloaded and subjected to an increasing superimposed load until either structural failure occurs or the superimposed load is equal to two and one-half times the load at which the deflection limitations specified in Section 1715.3.2 were reached, or the load is equal to two and one-half times the superimposed design load. In the case of structural components and assemblies for which deflection limitations are not specified in Section 1715.3.2, the test specimen shall be subjected to an increasing superimposed load until structural failure occurs or the load is equal to two and one-half times the desired superimposed design load. The allowable superimposed design load shall be taken as the lesser of:

1. The load at the deflection limitation given in Section 1715.3.2.
2. The failure load divided by 2.5.
3. The maximum load applied divided by 2.5.

**1715.3.2 Deflection.** The deflection of structural members under the design load shall not exceed the limitations in Section 1604.3.

**1715.4 Wall and partition assemblies.** Load-bearing wall and partition assemblies shall sustain the test load both with and without window framing. The test load shall include all design load components. Wall and partition assemblies shall be tested both with and without door and window framing.

**1715.5 Exterior window and door assemblies.** The design pressure rating of exterior windows and doors in buildings shall be determined in accordance with Section 1715.5.1 or 1715.5.2.

**Exception:** Structural wind load design pressures for window units smaller than the size tested in accordance with Section 1715.5.1 or 1715.5.2 shall be permitted to be higher than the design value of the tested unit provided such higher pressures are determined by accepted engineering analysis. All components of the small unit shall be the same as the tested unit. Where such calculated design pressures are used, they shall be validated by an additional test of the window unit having the highest allowable design pressure.

**1715.5.1 Exterior windows and doors.** Exterior windows and doors shall be tested and labeled as conforming to AAMA/WDMA/CSA 101/I.S.2/A440. The label shall state the name of the manufacturer, the approved labeling agency and the product designation as specified in AAMA/WDMA/CSA 101/I.S.2/A440. Products tested and labeled as conforming to AAMA/WDMA/CSA 101/I.S.2/A440 shall not be subject to the requirements of Sections 2403.2 and 2403.3. NYC

**1715.5.2 Exterior windows and door assemblies not provided for in Section 1715.5.1.** Exterior window and door assemblies shall be tested in accordance with ASTM E 330. Structural performance of garage doors shall be determined in accordance with either ASTM E 330 or ANSI/DASMA 108, and shall meet the acceptance criteria of ANSI/DASMA 108. Exterior window and door assemblies containing glass shall comply with Section 2403. NYC



The design pressure for testing shall be calculated in accordance with Chapter 16. Each assembly shall be tested for 10 seconds at a load equal to 1.5 times the design pressure.

**1715.6 Test specimens.** Test specimens and construction shall be representative of the materials, workmanship and details normally used in practice. The properties of the materials used to construct the test assembly shall be determined on the basis of tests on samples taken from the load assembly or on representative samples of the materials used to construct the load test assembly. Required tests shall be conducted or witnessed by an approved agency.

## SECTION BC 1716 MATERIAL AND TEST STANDARDS

### 1716.1 Test standards for joist hangers and connectors.

**1716.1.1 Test standards for joist hangers.** The vertical load-bearing capacity, torsional moment capacity and deflection characteristics of joist hangers shall be determined in accordance with ASTM D 1761, using lumber having a specific gravity of 0.49 or greater, but not greater than 0.55, as determined in accordance with AF&PA NDS for the joist and headers.

**Exception:** The joist length shall not be required to exceed 24 inches (610 mm).

**1716.1.2 Vertical load capacity for joist hangers.** The vertical load capacity for the joist hanger shall be determined by testing a minimum of three joist hanger assemblies as specified in ASTM D 1761. If the ultimate vertical load for any one of the tests varies more than 20 percent from the average ultimate vertical load, at least three additional tests shall be conducted. The allowable vertical load of the joist hanger shall be the lowest value determined from the following:

1. The lowest ultimate vertical load for a single hanger from any test divided by three (where three tests are conducted and each ultimate vertical load does not vary more than 20 percent from the average ultimate vertical load).
2. The average ultimate vertical load for a single hanger from all tests divided by six (where six or more tests are conducted).
3. The average from all tests of the vertical loads that produce a vertical movement of the joist with respect to the header is 0.125 inch (3.2 mm).
4. The sum of the allowable design loads for nails or other fasteners utilized to secure the joist hanger to the wood members and allowable bearing loads that contribute to the capacity of the hanger.
5. The allowable design load for the wood members forming the connection.

**1716.1.3 Torsional moment capacity for joist hangers.** The torsional moment capacity for the joist hanger shall be determined by testing at least three joist hanger assemblies as specified in ASTM D 1761. The allowable torsional moment of the joist hanger shall be the average

torsional moment at which the lateral movement of the top or bottom of the joist with respect to the original position of the joist is 0.125 inch (3.2 mm).

### 1716.1.4 Design value modifications for joist hangers.

Allowable design values for joist hangers that are determined by Item 4 or 5 in Section 1716.1.2 shall be permitted to be modified by the appropriate duration of loading factors as specified in AF&PA NDS but shall not exceed the direct loads as determined by Item 1, 2 or 3 in Section 1716.1.2. Allowable design values determined by Item 1, 2 or 3 in Section 1716.1.2 shall not be modified by duration of loading factors.

### 1716.2 Concrete and clay roof tiles.

**1716.2.1 Overturning resistance.** Concrete and clay roof tiles shall be tested to determine their resistance to overturning due to wind in accordance with ICC SBCCI NY SSTD 11 and Chapter 15.

**1716.2.2 Wind tunnel testing.** When roof tiles do not satisfy the limitations in Chapter 16 for rigid tile, a wind tunnel test shall be used to determine the wind characteristics of the concrete or clay tile roof covering in accordance with ICC SBCCI SSTD 11 and Chapter 15. NYC

## CHAPTER 18

# SOILS AND FOUNDATIONS

### SECTION BC 1801 GENERAL AND DEFINITIONS

**1801.1 Scope.** The provisions of this chapter shall apply to building and foundation systems in those areas not subject to scour or water pressure by wind and wave action. Buildings and foundations subject to such scour or water pressure loads shall be designed in accordance with Chapter 16 and Appendix G. (*Note: Where the text in this Code refers to ASCE 7, the 2005 edition shall be used; and where the text in this Code refers to ASCE 7-10, the 2010 edition shall be used.*)

**1801.2 Design.** Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the allowable stress design load combinations specified in Section 1605.3. The quality and design of materials used structurally in excavations and foundations shall conform to the requirements specified in Chapters 16, 19, 21, 22 and 23. Excavations and fills shall also comply with Chapter 33.

#### **1801.2.1 Foundation design for seismic overturning.**

Where foundations are proportioned using the load combinations of Sections 1605.2 or 1605.3.1 and the computation of seismic overturning effects is by equivalent lateral force or modal analysis, the proportioning shall be in accordance with Section 12.13.4 of ASCE 7-10.

**1801.3 Definitions.** The following terms shall, for the purposes of this chapter, have the meanings shown herein.

**AUGERED-CAST-IN-PLACE PILES.** Augered-cast-in-place piles are constructed by pumping grout into an augered hole during the withdrawal of the auger. The pile is reinforced with a single reinforcing bar, a reinforcing steel cage or a structural steel section.

**CAISSON PILES.** Steel cased piles constructed by advancing a steel shell seated into rock and drilling of an uncased socket within the rock. The shell and socket are filled with a steel core section or steel reinforcing, and concrete or grout.

**COMPACTED CONCRETE PILES.** Compacted concrete piles are constructed by filling a driven casing with low-strength concrete and compacting the concrete as the casing is withdrawn.

**COMPOSITE PILES.** Composite piles consist of two or more approved pile types joined together.

**CONCRETE-FILLED STEEL PIPE AND TUBE PILES.** Concrete-filled steel pipe and tube piles are constructed by driving a steel pipe or tube section into the soil and filling the pipe or tube section with concrete. The steel pipe or tube section is left in place during and after the deposition of the concrete. For the purposes of this code these piles shall be considered driven piles.

**DAMPPROOFING.** Dampproofing is a protective measure applied to building foundation walls and slabs to prevent moisture from passing into interior spaces.

**DEEP FOUNDATIONS.** Deep foundations are comprised of concrete, grout, wood or steel structural elements either driven, drilled or jacked into the ground or cast in place. Deep foundations are relatively slender in comparison to their length, with lengths exceeding 12 times the least horizontal dimension. Deep foundations derive their load-carrying capacity through skin friction, end bearing, or a combination thereof.

**DRIVEN UNCASSED PILES.** Driven uncased piles are constructed by driving a steel shell into the soil to shore an uncavated hole that is later filled with concrete. The steel casing is lifted out of the hole during the deposition of the concrete. Driven uncased piles are not permitted under the provisions of this code.

**ENLARGED BASE PILES.** Enlarged base piles are cast-in-place concrete piles constructed with a base that is larger than the diameter of the remainder of the pile. The enlarged base is designed to increase the load-bearing area of the pile in end bearing. Enlarged base piles include piles installed by driving a precast concrete tip or by compacting concrete into the base of the pile to form an enlarged base.

**HELICAL PILES.** Helical piles are manufactured deep foundation steel elements consisting of a shaft and one or more helical bearing plates (helices) screwed into the ground by application of torque on the shaft. The various products marketed as screw piles, torque anchors, and helical piers are considered helical piles.

**H-PILES.** Steel H-piles are constructed by driving a steel H-shaped section into the ground.

**FIXED HEADED PILE (DEEP FOUNDATION).** A pile connected to a pile cap in a manner that prevents rotation of the pile head.

**FREE HEADED PILE.** A pile with a head that is free to rotate.

**GEOTECHNICAL CAPACITY OF DEEP FOUNDATIONS.** The load that can be supported by the soil or rock surrounding deep foundation as determined using a recognized method of analysis or as established by load tests. The geotechnical capacity can be developed through skin friction, end bearing, or a combination thereof.

**LIQUEFACTION.** For granular soils, liquefaction is defined as the loss of shear strength in soils resulting from increased pore-water pressure and reduced effective stress that may develop as a result of cyclic loading during earthquakes. For cohesive soils with a plasticity index of less than 20, liquefaction is defined as any transient softening and

increased cyclic shear strains that may occur during earthquakes.

**MICROPILE.** A micropile is a drilled and grouted deep foundation element with a diameter that measures 5-inches (127 mm) to 14-inches (356 mm) that develops its load-carrying capacity by means of a bond zone in soil (also commonly known as a minipile).

**PIER FOUNDATION.** A pier foundation is a shallow foundation element of masonry or cast-in-place concrete construction. Piers are relatively short in comparison to their width, with lengths less than or equal to 12 times the least horizontal dimension of the pier. Piers derive their load-carrying capacity from end bearing on soil or rock.

**RETAINING WALL.** A wall that resists lateral or other forces caused by soil, rock, water or other materials, thereby limiting lateral displacement and the movement of the supported materials. Basement walls and vault walls that are parts of buildings and underground structures, including but not limited to utility vault structures, tunnels and transit stations, are not considered retaining walls.

**SHALLOW FOUNDATION.** A shallow foundation is an individual or strip footing, a mat foundation, a slab-on-grade foundation or a similar foundation element.

**UNDERPINNING.** The alteration of an existing foundation to transfer loads to a lower bearing stratum using new piers, piles, or other structural support elements installed below the existing foundation.

**WATERPROOFING.** Waterproofing is a protective measure applied to building foundation walls and slabs to prevent moisture and liquid water from passing into interior spaces.

## SECTION BC 1802 GEOTECHNICAL INVESTIGATIONS AND MATERIAL CLASSIFICATIONS

**1802.1 General.** Geotechnical investigations shall be subject to special inspections in accordance with Sections 1704.7, 1704.8 and 1704.9 and be conducted in conformance with Sections 1802.2 through 1802.7. An engineer shall scope, supervise and approve the subsurface investigation and the classification of the soil and rock encountered.

**1802.2 Where required.** A geotechnical investigation shall be conducted for:

1. New structures;
2. Horizontal enlargements;
3. Vertical enlargements or alterations necessitating new foundations or resulting in additional loading that exceeds 5 percent of the existing foundation design capacity; or
4. As required by the commissioner or applicant of record.

The geotechnical investigation shall be performed in accordance with Sections 1802.4 through 1802.6. For structures in Seismic Design Category C or D, the requirements of Sections 1802.2.1 and 1802.2.2 shall also apply.

**1802.2.1 Seismic Design Category C.** Where a structure is determined to be in Seismic Design Category C in accordance with Section 1613, the geotechnical investigation shall include an evaluation of the following potential hazards resulting from earthquake motions: slope instability, liquefaction and surface rupture due to faulting or lateral spreading. Peak ground acceleration for use in liquefaction analyses shall be determined in accordance with Section 1813.2.1.

**1802.2.2 Seismic Design Category D.** Where a structure is determined to be in Seismic Design Category D in accordance with Section 1613, the requirements for Seismic Design Category C, given in Section 1802.2.1, shall be met. In addition, the following shall be conducted:

1. A determination of lateral pressures on basement, cellar, and retaining walls due to earthquake motions. Peak ground acceleration for use in lateral pressure analyses shall be determined in accordance with Section 1813.2.1.
2. An assessment of potential consequences of any liquefaction and soil strength loss, including estimation of differential settlement, lateral movement or reduction in foundation soil-bearing capacity. Mitigation measures shall be addressed. Such measures shall be given consideration in the design of the structure and shall include, but are not limited to, ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements or any combination of these measures.

**1802.3 Material classification.** Soil and rock classification shall be based on materials disclosed by borings, test pits or other subsurface exploration methods. Soil classifications shall be determined in accordance with ASTM D 2487 (refer to Table 1802.3) and the supplemental definitions contained herein. Rock classifications shall be determined in accordance with generally accepted engineering practice and the supplemental definitions contained herein. Laboratory tests shall be conducted to ascertain these classifications where deemed necessary by the engineer responsible for the geotechnical investigation or the commissioner.

### BEDROCK.

**1. Hard sound rock (Class 1a).** Includes crystalline rocks, such as gneiss, granite, diabase and mica schist. Characteristics are as follows: the rock rings when struck with pick or bar; the rock does not disintegrate after exposure to air or water; the rock breaks with sharp fresh fracture; cracks are unweathered, less than  $\frac{1}{8}$ -inch (3.2 mm) wide, and generally no closer than 3 feet (914 mm) apart; and the RQD (rock quality designation) with a double tube, NX-size diamond core barrel is generally 85 percent or greater for each 5-foot (1524 mm) run; or core recovery with BX-size core is generally 85 percent or greater for each 5-foot (1524 mm) run.

**2. Medium hard rock (Class 1b).** Includes crystalline rocks of paragraph (1) of this subdivision, plus marble and serpentinite. Characteristics are as follows: all those listed in paragraph (1) of this subdivision, except that cracks

may be  $\frac{1}{4}$ -inch (6.4 mm) wide and slightly weathered, generally spaced no closer than 2 feet (610 mm) apart; and the RQD with a double tube, NX-size diamond core barrel is generally between 50 and 85 percent for each 5-foot (1524 mm) run; or core recovery with BX-size core is generally 50 to 85 percent for each 5-foot (1524 mm) run.

**3. Intermediate rock (Class 1c).** Includes rocks described in paragraphs (1) and (2) of this subdivision, plus cemented shales and sandstone. Characteristics are as follows: the rock gives dull sound when struck with pick or bar; does not disintegrate after exposure to air or water; broken pieces may show moderately weathered surfaces; may contain fracture and moderately weathered zones up to 1 inch (25 mm) wide spaced as close as 1 foot (305 mm) apart; and the RQD with a double tube, NX-size diamond core barrel is generally 35 to 50 percent for each 5-foot (1524 mm) run; or a core recovery with BX-size core of generally 35 to 50 percent for each 5-foot (1524 mm) run.

**4. Soft rock (Class 1d).** Includes rocks described in paragraphs (1), (2), and (3) of this subdivision in highly weathered condition, plus talc schist and poorly cemented shales and sandstones. Characteristics are: rock may soften on exposure to air or water; may contain highly weathered zones up to 3 inches (76 mm) wide but filled with stiff soil; and either the RQD with a double tube, NX-size diamond core barrel is less than 35 percent for each 5-foot (1524 mm) run or core recovery with BX-size core of generally less than 35 percent for each 5-foot (1524 mm) run, or a standard penetration resistance more than 50 blows per foot (0.3 meters).

**SANDY GRAVEL AND GRAVELS.** Consists of coarse-grained material with more than half of the coarse fraction larger than the #4 size sieve and contains little or no fines (GW and GP). The density of these materials shall be determined in accordance with the following:

**Dense (Class 2a).** These materials have a standard penetration test N-value greater than 30 blows per 1 foot (0.3 meter).

**Medium (Class 2b).** These materials have a standard penetration test N-value between 10 and 30 blows per 1 foot (0.3 meter).

**Loose (Class 6).** These materials have a standard penetration test N-value less than 10 blows per 1 foot (0.3 meter). These materials shall be considered nominally unsatisfactory bearing materials.

**GRANULAR SOILS.** These materials are coarse-grained soils consisting of gravel and/or sand with appreciable amounts of fines, and gravel. Soil types include GM, GC, SW, SP, SM, and SC. The density of granular materials shall be determined in accordance with the following:

**Dense (Class 3a).** These materials have a standard penetration test N-value of greater than 30 blows per 1 foot (0.3 meter).

**Medium (Class 3b).** These materials have a standard penetration test N-value of between 10 and 30 blows per 1 foot (0.3 meter).

**Loose (Class 6).** These materials have standard penetration test N-value of fewer than 10 blows per 1 foot (0.3 meter). These materials shall be considered nominally unsatisfactory bearing materials.

**CLAYS.** For soil types SC, CL and CH in the absence of sufficient laboratory data, the consistency of clay materials shall be determined in accordance with the following:

**Hard (Class 4a).** Clay requiring picking for removal, a fresh sample of which cannot be molded by pressure of the fingers; or having an unconfined compressive strength in excess of 4 TSF (383 kPa); or having a standard penetration test where the N-value is greater than 30 blows per 1 foot (0.3 meter).

**Stiff (Class 4b).** Clay that can be removed by spading, a fresh sample of which requires substantial pressure of the fingers to create an indentation; or having an unconfined compressive strength of between 1 TSF (96 kPa) and 4 TSF (383 kPa); or having a standard penetration test where the N-value is between 8 and 30 blows per 1 foot (0.3 meter).

**Medium (Class 4c).** Clay that can be removed by spading, a fresh sample of which can be molded by substantial pressure of the fingers; or having an unconfined compressive strength of between 0.5 TSF (48 kPa) and 1 TSF (96 kPa); or having a standard penetration test where the N-value is between 4 and 8 blows per 1 foot (0.3 meter).

**Soft (Class 6).** Clay, a fresh sample of which can be molded with slight pressure of the fingers; or having an unconfined compressive strength of less than 0.5 TSF (48 kPa); or having a standard penetration test where the N-value is fewer than 4 blows per 1 foot (0.3 meter). This material shall be considered nominally unsatisfactory bearing material.

**SILTS AND CLAYEY SILTS.** For soil types ML and MH in the absence of sufficient laboratory data, the consistency of silt materials shall be determined in accordance with the following:

**Dense (Class 5a).** Silt with a standard penetration test where the N-value is greater than 30 blows per 1 foot (0.3 meter).

**Medium (Class 5b).** Silt with a standard penetration test where the N-value is between 10 and 30 blows per 1 foot (0.3 meter).

**Loose (Class 6).** Silt with a standard penetration test where the N-value is fewer than 10 blows per 1 foot (0.3 meters). This material shall be considered nominally unsatisfactory bearing material.



**TABLE 1804.2  
UNIFIED SOIL CLASSIFICATION  
(Including Identification and Description)**

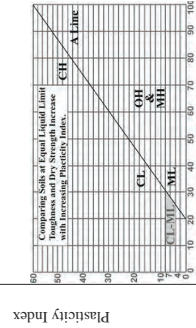
MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS)		INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA		
1	2	3	4	5	6	7			
Coarse-grained Soils	Gravels More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size.)	Clean Gravels (Little or no fines)	Well-graded gravels, gravel-sand mixture, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture condition, and drainage characteristics.	$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 $D_{10} \times D_{60}$	Not meeting all gradation requirements for GW		
		Gravels with Fines (Appreciable amount of fines)	Silty gravels, gravel and silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are	
			Clayey gravels, gravel and clay mixtures.	Plastic fines (for identification procedures see CL below).	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.		Atterberg limits above "A" line with PI greater than 7	borderline cases requiring use of dual symbols.	
		Clean Sand (Little or no fines)	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.			$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	Borderline cases requiring use of dual symbols.	
Sands	No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size.)		Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.		GM, GC, SM, SC. GW, GP, SW, SP	Not meeting all gradation requirements for SW		
		Sands with Fines (Appreciable amount of fines)	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	Example: Silty sand, gravelly; about 20% hard, angular gravel particles 1/2-in. maximum size; rounded and subangular sand grains, coarse to fine; about 15% nonplastic fines with low dry strength, well compacted and moist in place; alluvial sand; (SM).	Less than 5% More than 12% 5% to 12%	Atterberg limits above "A" line or PI less than 4	Limits plotting in hatched zone with PI between 4 and 7 are	
			Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).			Atterberg limits above "A" line with PI greater than 7	borderline cases requiring use of dual symbols.	
		Identification Procedure on Fraction Smaller than No. 40 Sieve Size.		Dry Strength (Crushing Characteristics)	Toughness (Consistency near PL)				
Fine-grained Soils	Silts and Clays Liquid limit is less than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	Use grain-size curve in identifying the fractions as given under field identification.		
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions		
		OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	Give typical name; indicate degree and character of plasticity; amount and maximum size of coarse grains; color in wet condition; odor, if any; local or geologic name and other pertinent descriptive information; and symbol in parentheses.		
		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium			
		CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High			
More than half of material is smaller than No. 200 sieve size.	Silts and Clays Liquid limit is greater than 50	OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium	Plasticity Index		
		Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture		Example: Clayey silt, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (ML)			
		Highly Organic Soils						LIQUID LIMIT PLASTICITY CHART For laboratory classification of fine-grained soils	

1. Boundary classifications: Soils possessing characteristics of two groups are designed by combinations of group symbols. For example GM-GC, well-graded gravel-sand mixture with clay binder.

2. All sieve sizes on this chart are U.S. standard.

3. Adopted by Corps of Engineers and Bureau of Reclamation, January 1952.

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1. Boundary classifications: Soils possessing characteristics of two groups are designed by combinations of group symbols. For example GM-GC, well-graded gravel-sand mixture with clay binder.  
 2. All sieve sizes on this chart are U.S. standard.  
 3. Adopted by Corps of Engineers and Bureau of Reclamation, January 1952.

**1802.4 Investigation.** An engineer shall scope and supervise the geotechnical investigation. The geotechnical investigation shall be sufficient for evaluating soil and rock conditions including but not limited to material classification, stratigraphy, groundwater, slope stability, soil and rock strength, adequacy of load-bearing soils and rock, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness. The investigation shall comply with Sections 1802.4.1 through 1802.4.4.

**1802.4.1 Scope of investigation.** The scope of the geotechnical investigation, including the number, types and depths of borings, the number of test pits or the number of alternative test methods; the equipment used to drill and sample; the in-situ testing; and the laboratory testing program shall be determined by the engineer responsible for the investigation, subject to the requirements of this chapter.

1. Borings shall be uniformly distributed under the structure or distributed in accordance with load patterns imposed by the structure.
2. As a minimum, investigations for structures shall include:
  - 2.1. One exploratory boring for built-over areas up to and including 750 square feet ( $69.7 \text{ m}^2$ ).
  - 2.2. Two exploratory borings for built-over areas greater than 750 square feet ( $69.7 \text{ m}^2$ ) but less than 5,000 square feet ( $465 \text{ m}^2$ ), and at least one additional boring for each additional 2,500 square feet ( $233 \text{ m}^2$ ), or part thereof, of built-over areas up to 20,000 square feet ( $1860 \text{ m}^2$ ).
  - 2.3. At least one boring for each additional 5,000 square feet ( $465 \text{ m}^2$ ), or part thereof, of built-over areas in excess of 20,000 square feet ( $1860 \text{ m}^2$ ).
3. At a minimum, investigations for retaining walls greater than 10 feet (3.05 m) in height shall include one exploratory boring for every 50 linear feet (15.24 m) of wall.
4. Borings shall be taken into bedrock, or to an adequate depth below the top of the load-bearing strata to demonstrate that the foundation loads have been sufficiently dissipated and to evaluate global stability of retaining walls.
5. For structures having an average area load (dead plus live) of 1,000 pounds per square foot ( $47.9 \text{ kN/m}^2$ ) or more, at least one boring for every 10,000 square feet ( $930 \text{ m}^2$ ) of footprint area shall penetrate at least 100 feet (30 480 mm) below the curb grade or 5 feet (1524 mm) into bedrock of Class 1c or better, whichever is less.
6. At least one-half of the borings satisfying this requirement shall be located within the limits of the built-up area and the remainder shall be within 25 feet (7620 mm) of the built-up area limits.

7. For structures to be supported on deep foundations, the required number of borings shall be not less than two borings, and based on a minimum of one boring per 2,000 square feet ( $609.6 \text{ m}^2$ ) for the first 20,000 square feet ( $1860 \text{ m}^2$ ) and one boring per every additional 4,000 square feet ( $609.6 \text{ m}^2$ ).

8. All boring, sampling, and in-situ testing operations shall be subject to special inspection in accordance with Section 1704.7.4.

**Exception:** Test pits may be substituted for borings for one and two-story structures, and may be used only to establish the top of rock, where practical, for taller structures. For taller structures, the engineer shall submit a test pit observation report to the commissioner; for one and two-story structures, the registered design professional may submit a test pit observation report to the commissioner.

**1802.4.2 Existing data.** At the request of the engineer responsible for the geotechnical investigation, the suitable borings, test pits, probings, and the logs and records that were obtained as part of earlier exploration programs and that meet the requirements of this section may be used as partial fulfillment of the requirements of this section, subject to the approval of the commissioner. Additional borings shall be made at the direction of the engineer responsible for the geotechnical investigation when uncertainty exists as to the accuracy of the available information or specific new project or loading conditions indicate the need for additional information.

**1802.4.3 Groundwater table.** The geotechnical investigation shall determine the existing groundwater table.

**1802.4.4 Compressible soils.** In areas containing compressible soils, the geotechnical investigation shall determine the extent of these soils in the plan area of the structure and shall be subject to the requirements of Section 1802.3.

**1802.5 Soil and rock sampling.** The soil boring and sampling procedures and apparatus shall be in accordance with ASTM D 1586 and ASTM D 1587 and generally accepted engineering practice. The rock coring, sampling procedure and apparatus shall be in accordance with ASTM D 2113 and generally accepted engineering practice. Rock cores shall be obtained with a double-tube core barrel with a minimum outside diameter of  $2\frac{7}{8}$  inches (73 mm). With the approval of the engineer responsible for the geotechnical investigation, smaller-diameter double-tube core barrels may be used under special circumstances such as telescoping casing to penetrate boulders, or space limitations requiring the use of drill rigs incapable of obtaining large-diameter cores.

**1802.5.1 Bedrock support.** Where the foundation design relies on rock to support footings, piles or caisson sockets, a sufficient number of rock corings shall extend at least 10 feet (3048 mm) below the lowest level of bearing to provide assurance of the rock soundness. Where foundations are to rest on bedrock and such rock is exposed over a part or all of the area of the building, borings are not required in those areas where rock is exposed, provided the following requirements are met:

1. The presence of defects or the inclination of bedding planes in the rock are of such size and location so as not to affect stability of the foundation.
2. The foundation is not designed for bearing pressures exceeding those permitted in Table 1802.3.

**1802.5.2 Alternative investigative methods.** The engineer responsible for the geotechnical investigation may engage specialized technicians to conduct alternative investigative methods such as cone penetrometer testing. Data from these investigations may be used to (1) supplement soil boring and rock coring information, provided there is a demonstrated correlation between the findings, and (2) determine material properties for static and seismic or liquefaction analyses. Subject to the approval of the commissioner, alternate exploration methods may replace borings on a one and one-half for one basis, but in no case shall there be fewer than half the required standard borings as per Section 1802.4.1, and no less than two standard borings. The boring depth requirements of Section 1802.4.1 shall be accomplished with borings. The alternative investigative methods must be capable of extending to the depths of the required borings. Other in-situ testing methods, such as geophysical, vane shear, and pressure meter, may be used to determine engineering design parameters, but may not be used as a substitute for the required number of borings.

**1802.5.3 Material disposition.** Soil and rock samples shall be maintained in an accessible location by the permit holder or owner and made available to the engineer responsible for the geotechnical investigation and to the department, until the foundation work has been completed and accepted, or until 1 year after the investigation is complete, whichever is longer.

## 1802.6 Reports.

**1802.6.1 Conditions requiring geotechnical reports.** The owner or applicant of record shall submit a written report to the commissioner for any of the following conditions:

1. Any load-bearing value greater than those in Section 1804 is claimed.
2. The structure is determined to be in Seismic Design Category C or D in accordance with Section 1613.
3. Test pits are implemented in lieu of borings as per Section 1802.4.1.
4. The structure will bear on or above compressible soils (see Section 1804.2.2), uncontrolled fill (see Section 1804.2.3), or artificially treated soils (see Section 1804.2.4).
5. As required by the commissioner.

**1802.6.2 Information required in geotechnical reports.** The geotechnical report shall be prepared by the engineer responsible for the geotechnical investigation and shall be signed and sealed. The report shall include, but need not be limited to, the following information:

1. A description of the planned structure.

2. A plot showing the location of test borings, excavations, probes, and/or other exploration techniques.
3. A complete record of the soil and/or rock sample descriptions.
4. A record of the soil and/or rock profile.
5. Elevation of the groundwater table, if encountered.
6. Results of in-situ or geophysical testing.
7. Results of laboratory testing.
8. Recommendations for foundation type and design criteria, including but not limited to allowable bearing capacity of natural or compacted soil and/or rock; mitigation of the effects of liquefaction (if applicable); differential settlement and varying soil and/or rock strength; and the effects of adjacent loads.
9. Expected total and differential settlement.
10. Special design and construction provisions for footings or foundations founded on expansive soils, as necessary.
11. Compacted fill material properties and testing in accordance with Section 1803.5.
12. Controlled low-strength material properties and testing in accordance with Section 1803.6.
13. A list of anticipated special inspections required for construction of earthwork and foundations.
14. For deep foundations reports, the requirements outlined in Section 1808.2.2.

**1802.7 Construction documents.** Construction documents shall be prepared in accordance with Section 106.7.1.

## SECTION BC 1803 EXCAVATION, GRADING AND FILL

**1803.1 Excavations near foundations.** Excavations for any purpose shall not remove vertical or lateral support from any foundation without first underpinning or protecting the foundation against settlement or lateral translation. Where required, underpinning or shoring shall be provided in accordance with Section 1814.

**1803.2 Placement of backfill.** The excavation outside the foundation shall be backfilled with soil that is free of organic material, construction debris, or boulders. A controlled low-strength material (CLSM) can be used as backfill in lieu of soil. Soil backfill shall be placed in lifts and compacted in a manner that does not damage the foundation or the waterproofing or dampproofing material.

**Exception:** Controlled low-strength material need not be compacted.

**1803.3 Site grading.** The ground immediately adjacent to the foundation shall be sloped away from the structure as needed, or an approved alternate method of diverting water away from the foundation shall be used, where surface water would detrimentally affect the foundation material (soil and/or

rock). Grading shall not be detrimental to the bearing material of adjacent structures. Site grading shall also comply with Section 1101.11 of the *New York City Plumbing Code*.

**1803.3.1 Seepage.** In an excavation where soil and groundwater conditions are such that an inward or upward seepage might be produced in materials intended to provide vertical or lateral support for foundation elements or for adjacent foundations, excavating methods shall control or prevent the inflow of ground water to prevent disturbance of the soil material in the excavation or beneath existing buildings. No foundation shall be placed on soil that has been disturbed by seepage unless remedial measures have been taken.

**1803.4 Grading and filling in flood hazard areas.** Grading and/or filling in areas of special flood hazard shall not be permitted except as permitted in Appendix G.

**1803.5 Compacted fill material.** Where foundations will bear on compacted fill material, the compacted fill shall comply with the provisions of a geotechnical report prepared, signed and sealed by the engineer, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of compacted fill material.
2. Specifications for material to be used as compacted fill.
3. Test method(s) to be used to determine the maximum dry density and optimum moisture content of the material to be used as compacted fill.
4. Maximum allowable thickness of each lift of compacted fill material.
5. Field test method(s) for determining the in-place dry density of the compacted fill.
6. Minimum acceptable in-place dry density expressed as a percentage of the maximum dry density determined in accordance with Item 3.
7. Number and frequency of field tests required to determine compliance with Item 6.
8. Acceptable types of compaction equipment for the specified fill materials.

**1803.6 Controlled low-strength material (CLSM).** Where footings will bear on controlled low-strength material (CLSM), the CLSM shall comply with the provisions of a geotechnical report prepared, signed and sealed by the engineer, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of the CLSM.
2. Specifications for the CLSM.
3. Laboratory or field test method(s) to be used to determine the compressive strength or bearing capacity of the CLSM.
4. Test methods for determining the acceptance of the CLSM in the field.
5. Number and frequency of field tests required to determine compliance with Item 4.

## SECTION BC 1804 ALLOWABLE LOAD-BEARING VALUES OF SOILS AND ROCK

**1804.1 Design.** The allowable bearing pressures provided in Table 1804.1 shall be used with the allowable stress design load combinations specified in Section 1605.3.

**1804.2 Allowable bearing pressure.** The allowable bearing pressure for supporting soil and rock at or near the surface shall not exceed the values specified in Table 1804.1, unless data to substantiate the use of a higher value are developed and contained in the engineer's geotechnical report, and the commissioner approves such value. Allowable bearing pressure shall be considered to be the pressure at the base of a foundation in excess of the stabilized overburden pressure existing at the same level prior to construction operations.

### 1804.2.1 Nominally unsatisfactory bearing material.

Organic silts, organic clays, peats, soft clays, loose granular soils, loose silts, and varved silts shall be considered nominally unsatisfactory bearing material. The allowable bearing pressure shall be determined independently of Table 1804.1 subject to the following:

1. For varved silts, the soil bearing pressure produced by the proposed building shall not exceed 2 tons per square foot (192 kPa), except that for desiccated or over consolidated soils, higher bearing pressures are allowed subject to approval by the commissioner.
2. For organic silts or clays, peats, soft clays, loose granular soils, or loose silts, the engineer responsible for the geotechnical investigation shall establish the allowable soil bearing pressure based upon the soil's specific engineering properties. This may require that the soils be preconsolidated, artificially treated or compacted.
3. A report prepared, signed and sealed by the engineer is required to be filed with the department to substantiate the design soil pressures to be used on soil materials and shall contain, at a minimum:
  - 3.1. Sufficient laboratory test data on the compressible material to indicate the soil strength and the preconsolidation pressure, coefficient of consolidation, coefficient of compressibility, permeability, secondary compression characteristics, and Atterberg limits.
  - 3.2. Where the design contemplates improvement of the natural bearing capacity and/or reduction in settlements by virtue of preloading, cross sections showing the amount of fill and surcharge to be placed, design details showing the required time for surcharging, and computations showing the amount of settlement to be expected during surcharging and the estimated amount and rate of settlement expected to occur after the structure has been completed, including the influence of dead and live loads of the structure.



**TABLE 1804.1**  
**ALLOWABLE BEARING PRESSURES**

CLASS OF MATERIALS (Notes 1 and 3)	MAXIMUM ALLOWABLE BEARING PRESSURE (TSF)	MAXIMUM ALLOWABLE BEARING PRESSURE (kPa)
1. Bedrock (Notes 2 and 7)		
1a Hard sound rock	60	5,746
1b Medium rock	40	3,830
1c Intermediate rock	20	1,915
1d Soft rock	8	766
2. Sandy gravel and gravel (GW, GP) (Notes 3, 4, 8, and 9)		
2a Dense	10	958
2b Medium	6	575
3. Granular soils (GC, GM, SW, SP, SM, and SC) (Notes 4, 5, 8, and 9)		
3a Dense	6	575
3b Medium	3	287
4. Clays (SC, CL, and CH) (Notes 4, 6, 8, and 9)		
4a Hard	5	479
4b Stiff	3	287
4c Medium	2	192
5. Silts and silty soils (ML and MH) (Notes 4, 8, and 9)		
5a Dense	3	287
5b Medium	1.5	144
6. Nominally Unsatisfactory Bearing Materials: Loose granular soils Soft clay soils Loose Silt • All organic silts, organic clays, peats, soft clays, granular soils and varved silts	See 1804.2.1	See 1804.2.1
7. Controlled and uncontrolled fills	See 1804.2.2 or 1804.2.3	See 1804.2.2 or 1804.2.3

## Notes:

- Where there is doubt as to the applicable classification of a soil or rock stratum, the allowable bearing pressure applicable to the lower class of material to which the given stratum might conform shall apply.
- The tabulated values of allowable bearing pressures apply only for massive rocks, or for sedimentary or foliated rocks where the strata are level or nearly so, and then only if the area has ample lateral support. The allowable bearing pressure for tilted strata and their relation to nearby slopes or excavations shall be evaluated by the engineer responsible for the geotechnical investigation. The tabulated values for Class 1a materials (hard sound rock) may be increased by 25 percent provided the engineer performs additional tests and/or analyses substantiating the increase.
- For intermediate conditions, values of allowable bearing pressure shall be estimated by interpolation between indicated extremes.
- Footings embedded in soils shall be in accordance with Section 1805.3 and the width of the loaded area shall not be less than 18 inches (457 mm), unless analysis demonstrates that the proposed construction will have a minimum factor of safety of 2.0 against shear failure of the soil.
- Estimates of settlements shall govern the allowable bearing pressure, subject to the maximums given in this table, and as provided in Section 1804.2.
- Allowable bearing pressure of clay soils shall be established on the basis of the strength of such soils as determined by field or laboratory tests and shall provide a factor of safety against failure of the soil of not less than 2.0 computed on the basis of a recognized procedure of soils analysis, shall account for probable settlements of the building and shall not exceed the tabulated maximum values.
- Allowable bearing pressure may be increased due to embedment of the foundation. The allowable bearing pressure for intermediate rock (1c), medium hard rock (1b), and hard sound rock (1a) shall apply where the loaded area is on the rock surface. Where the loaded area is below the rock surface and is fully confined by the adjacent rock mass and provided that the adjacent rock mass above the bearing surface is of the same rock class or better, and the rock mass has not been shattered by blasting or otherwise is or has been rendered unsound, the allowable bearing pressure may be increased 10 percent of the base value for each 1 foot (0.3 meters) of embedment below the surface of the adjacent rock surface in excess of 1 foot (0.3 meters), but shall not exceed 200 percent of the values.
- The allowable bearing pressure for soils of Classes 2, 3, 4, and 5 determined in accordance with Notes 3, 4, and 5 above, shall apply where the loaded area is embedded 4 feet (1219 mm) or less in the bearing stratum. Where the loaded area is embedded more than 4 feet (1219 mm) below the adjacent surface of the bearing stratum, and is fully confined by the weight of the adjacent soil, the allowable bearing pressure may be increased 5 percent of the base value for each 1-foot (305 mm) additional embedment, but shall not exceed twice the values. Increases in allowable bearing pressure due to embedment shall not apply to soft rock, clays, silts and soils of Classes 6 and 7.
- The allowable bearing pressure for soils of Classes 2, 3, 4, and 5 determined in accordance with this table and the notes thereto, may be increased up to  $\frac{1}{3}$  where the density of the bearing stratum below the bottom of the footings increases with depth and is not underlain by materials of a lower allowable bearing pressure. Such allowable bearing pressure shall be demonstrated by a recognized means of analysis that the probable settlement of the foundation due to compression, and/or consolidation does not exceed acceptable limits for the proposed building.
- The maximum toe pressure for eccentrically loaded footings may exceed the allowable bearing pressure by up to 25 percent if it is demonstrated that the heel of the footing is not subjected to tension.

- 3.3. A detailed analysis showing that the anticipated future settlement will not adversely affect the performance of the structure.
- 3.4. Where strip drains, sand drains, or stone columns are to be used, computations showing the diameter, spacing, and anticipated method of installation of such drains.
- 3.5. Records of settlement plate elevations and pore pressure readings, before, during, and after surcharging.

**1804.2.2 Controlled fills.** Fills shall be considered as satisfactory bearing material of the applicable class when placed in accordance with the following procedures and subject to the special inspection provisions of Chapter 17:

1. Area to be filled shall be stripped of all organic materials, rubbish and debris.
2. Fill shall not be placed when frozen or on frozen or saturated subgrade.
3. The special inspection agency shall approve the subgrade prior to fill placement.
4. Fill material shall consist of gravel, crushed rock, recycled concrete aggregate, well-graded sand or a mixture of these, or equivalent materials with a maximum particle size of 3 inches (76.2 mm) and a maximum of 10 percent passing the #200 sieve.
5. Fill shall be placed and compacted in lifts, not exceeding 12 inches (305 mm), at its optimum moisture content, plus or minus 2 percent, and to not less than a density of 95 percent of the optimum density as determined by ASTM D 1557.
6. Fill density shall be verified by in-place tests made on each lift.

**1804.2.2.1 Allowable bearing pressure of controlled fills.** Provided the capacity of the underlying soil is not exceeded, the allowable bearing pressure of controlled fill shall be limited to:

1. 6 tons per square foot (766 kPa) for gravel and crushed rock.
2. 3 tons per square foot (383 kPa) for recycled concrete aggregate and well-graded sand.

**1804.2.3 Uncontrolled fills.** Fills other than controlled fill may be considered as satisfactory bearing material of applicable class, subject to the following:

1. Where spread footings will be used, the soil within the built-up area shall be explored using test pits at every column. All test pits shall extend to depths equal to the smaller width of the footing and at least one test pit shall penetrate at least 8 feet (2438 mm) below the level of the bottom of the proposed footings. All test pits shall be backfilled with properly compacted fill. Borings may be used in lieu of test pits, provided that continuous samples of at least 3 inches (76 mm) in diameter are recovered. Where mat foundations will be used, one test pit or minimum 3 inch (76 mm) diameter sampler boring shall

be provided for every 1,000 square feet (232.3 m<sup>2</sup>) of building footprint area. For continuous concrete footings, one test pit or minimum 3 inch (76 mm) diameter sampler boring shall be provided for every 25 linear feet (7.62 m).

2. The building area shall be additionally explored using one standard boring for every 2,500 square foot (232.3 m<sup>2</sup>) of building footprint area. These borings shall be carried to a depth sufficient to penetrate into natural ground, but not less than 20 feet (6096 mm) below grade.
3. The fill shall be composed of material that is free of voids and free of extensive inclusions of mud and organic materials such as paper, wood, garbage, cans, or metallic objects and debris.
4. The allowable soil bearing pressure on satisfactory uncontrolled fill material shall not exceed 2 tons per square foot (192 kPa). One and two-family dwellings may be founded on satisfactory uncontrolled fill provided the dwelling site has been explored using at least one test pit, penetrating at least 8 feet (2438 mm) below the level of the bottom of the proposed footings, and the fill has been found to be composed of material that is free of voids and generally free of mud and organic materials, such as paper, garbage, cans, or metallic objects, and debris. Test pits shall be backfilled with properly compacted fill.

**1804.2.4 Artificially treated soils.** Nominally unsatisfactory soil materials that are artificially compacted, cemented, or preconsolidated may be used for the support of buildings, and nominally satisfactory soil materials that are similarly treated may be used to resist soil bearing pressures in excess of those indicated in Table 1804.1. The engineer shall develop treatment plans and procedures and post-treatment performance and testing requirements, and submit such plans, procedures, and requirements to the commissioner for approval. After treatment, a sufficient amount of sampling and/or in-situ tests shall be performed in the treated soil to demonstrate the efficacy of the treatment for the increased bearing pressure.

#### **1804.3 Reserved.**

### **SECTION BC 1805 SHALLOW FOUNDATIONS**

**1805.1 General.** Shallow foundations shall be designed and constructed in accordance with Sections 1805.1 through 1805.9. Shallow foundations shall be constructed on suitable bearing materials established in accordance with the requirements of Sections 1803 and 1804.

**1805.2 Stepped footings.** The top surface of footings shall be level. The bottom surface of footings is permitted to have a slope not exceeding one unit vertical in 10 units horizontal (10 percent slope). Footings shall be stepped where necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than one unit vertical in 10 units horizontal (10 percent slope).

**1805.3 Depth of footings.** The minimum depth of shallow foundations below the undisturbed ground surface shall be 12 inches (305 mm). Where applicable, the depth of shallow foundations shall also conform to Section 1805.3.1.

**1805.3.1 Frost protection.** Except where otherwise protected from frost, shallow foundations, pile caps, and other permanent supports of buildings and structures shall be protected from frost by one or more of the following methods:

1. Extending a minimum of 4 feet (1219 mm) below the lowest adjacent permanent exposed grade;

**Exception:** Grade beams shall be embedded a minimum of 18 inches below the lowest adjacent permanent exposed grade.

2. Constructing in accordance with ASCE-32; or
3. Erecting on solid rock.

**Exception:** Free-standing buildings meeting all of the following conditions are not required to be frost protected:

1. Classified in Structural Occupancy Category I (see Table 1604.5);
2. Area of 400 square feet (37 m<sup>2</sup>) or less; and
3. Eave height of 10 feet (3048 mm) or less.

**1805.3.2 Foundations on frozen soil.** Shallow foundations shall not bear on frozen soil.

**Exception:** Temporary structures may bear on frozen soil if the soil is maintained in a frozen condition throughout the service life of the temporary structures being supported. The method of maintaining the soil in a frozen condition shall be approved by the commissioner.

**1805.4 Shallow foundations at different levels.** Where shallow foundations are supported at different levels, or are at different levels from the shallow foundations of adjacent structures, the influence of the pressures under the higher foundation on the stability of the lower foundations shall be considered in the design. The design shall consider the requirements for lateral support of the material supporting the higher foundation, the additional load imposed on the lower foundations, and assessment of the effects of dragdown on piles supporting adjacent buildings or compression of soils supporting adjacent buildings.

**1805.5 Shallow foundations.** Shallow foundations shall be designed and constructed in accordance with Sections 1805.5.1 through 1805.5.6.

**1805.5.1 Design.** Shallow foundations shall be designed so that the allowable bearing capacity of the soil is not exceeded, and that differential settlements are within the allowable limits for the structure. The minimum width of shallow foundations shall be 18 inches (457 mm).

**1805.5.1.1 Design loads.** Shallow foundations shall be designed for the most unfavorable effects due to the combinations of loads specified in Section 1605.3. The dead load shall include the weight of shallow foundations and overlying fill. Reduced live loads, as specified in Section 1607.9, are permitted to be used in the design of shallow foundations.

fied in Section 1607.9, are permitted to be used in the design of shallow foundations.

**1805.5.1.2 Vibratory loads.** Where machinery operations or other vibrations are transmitted through the shallow foundations, consideration shall be given in the shallow foundation design to prevent detrimental disturbances of the soil.

**1805.5.1.3 Shifting or moving soils.** When the possibility of shifting or moving soil exists, the short and long term impact of such soils shall be considered in the design of shallow foundations.

**1805.5.2 Concrete shallow foundations.** The design, materials and construction of concrete shallow foundations shall comply with Sections 1805.5.2.1 through 1805.5.2.5 and the provisions of Chapter 19.

**1805.5.2.1 Concrete strength.** Concrete in shallow foundations shall have a specified compressive strength ( $f'_c$ ) of not less than 2,500 pounds per square inch (psi) (17 237 kPa) at 28 days.

**1805.5.2.2 Footing seismic ties.** Where a structure is assigned to Seismic Design Category D in accordance with Section 1613, individual spread footings founded on soil defined in Section 1613.5.2 as Site Class E or F shall be interconnected by ties. Ties shall be capable of carrying, in tension or compression, a force equal to the product of the larger footing load times the seismic coefficient SDS divided by 10 unless it is demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade or reinforced concrete slabs on grade.

**1805.5.2.3 Plain concrete footings.** The thickness of plain concrete footings supporting walls of other than light-frame construction shall not be less than 8 inches (203 mm) where placed on soil.

**Exception:** For plain concrete footings supporting Group R-3 occupancies, the thickness is permitted to be 6 inches (152 mm), provided that the footing does not extend beyond a distance greater than the thickness of the footing on either side of the supported wall.

**1805.5.2.4 Placement of concrete.** Concrete shallow foundations shall not be placed through water unless a tremie or other method approved by the commissioner is used. Where placed under or in the presence of water, the concrete shall be deposited by approved means to ensure minimum segregation of the mix and negligible turbulence of the water.

**1805.5.2.5 Protection of concrete.** No shallow foundation shall be placed on frozen soils unless the soils are maintained in frozen condition throughout the service life of the structure being supported. No foundation shall be placed in freezing weather unless provision is made to maintain the underlying soil free of frost. Concrete shallow foundations shall be protected from freezing during depositing and for a period of not less than five days thereafter. Water shall not be allowed to flow through the deposited concrete.

**1805.5.3 Masonry-unit footings.** The design, materials and construction of masonry-unit footings shall comply with the provisions of Chapter 21.

**1805.5.4 Steel grillage footings.** Grillage footings of structural steel shapes shall be separated with approved steel spacers and be entirely encased in concrete with at least 6 inches (152 mm) on the bottom and at least 4 inches (102 mm) at all other points. The spaces between the shapes shall be completely filled with concrete or cement grout.

**1805.5.5 Timber footings.** Refer to Chapter 23.

**1805.5.6 Wood foundations.** Refer to Chapter 23.

**1805.5.7 Pier foundations.** The design, materials, and construction of pier foundations shall conform to the requirements of Sections 1805.5.2, 1805.5.3, and 1805.5.7.1 through 1805.5.7.6.

**Exception:** Piers shall be load tested as a deep foundation in accordance with the applicable portions of Section 1808 when the bearing stratum is not physically available for inspection during construction as required by Chapter 17.

**1805.5.7.1 Dimensions and height.** The minimum horizontal dimension of piers shall be 2 feet (610 mm), and the height shall not exceed 12 times the least horizontal dimension.

**1805.5.7.2 Concrete design.** Where adequate lateral support is furnished by the surrounding materials defined in Section 1808.7, piers may be constructed of plain or reinforced concrete and the requirements of ACI 318 shall apply.

**Exception:** Where adequate lateral support is not provided, and the ratio of unsupported height to least horizontal dimension does not exceed three, piers of plain concrete shall be designed and constructed as pedestals in accordance with ACI 318. Where the unsupported height to least horizontal dimension exceeds three, piers shall be constructed of reinforced concrete, and shall conform to the requirements for columns in ACI 318.

**1805.5.7.3 Reinforcement placement.** Reinforcement shall be tied and placed as a unit in the pier prior to placement of concrete.

**Exception:** Steel dowels embedded 5 feet (1524 mm) or less in the pier may be placed individually. Reinforcement is permitted to be wet set and the concrete cover that is otherwise required to measure a minimum of  $2\frac{1}{2}$  inches (64 mm) may be reduced to 2 inches (51 mm) for Groups R-3 and U occupancies not exceeding two stories of light-frame construction, provided the construction method is approved by the commissioner.

**1805.5.7.4 Concrete placement.** Concrete shall be placed in such a manner as to ensure the exclusion of any foreign matter and to fill the full lateral dimensions of each pier. Concrete shall not be placed through water except where a tremie or other approved method is

used. When depositing concrete from the top of the pier, the concrete shall not be chuted directly into the pier but shall be poured in a rapid and continuous operation through a funnel hopper centered at the top of the pier.

**1805.5.7.5 Steel shell.** Where concrete piers are entirely encased within a circular steel shell, and the area of the shell steel is considered reinforcing steel, the steel shall be protected under the conditions specified in Section 1808.2.12. Horizontal joints in the shell shall be spliced to comply with Section 1808.2.11.

**1805.5.7.6 Dewatering.** Where piers are carried to depths below the groundwater level, the piers shall be constructed by a method that will provide accurate preparation and inspection of the subgrade in dry conditions.

**1805.5.8 Foundation walls.** Concrete and masonry foundation walls shall be designed in accordance with Chapter 19 or 21, respectively.

**1805.5.8.1 Foundation wall thickness.** The minimum thickness of concrete and masonry foundation walls shall comply with Section 1805.5.8.1.1.

**1805.5.8.1.1 Thickness based on walls supported.**

The thickness of foundation walls shall not be less than the thickness of the wall supported, except that foundation walls of at least 8 inch (203 mm) nominal width are permitted to support brick-veneered frame walls and 10 inch wide (254 mm) cavity walls.

**1805.5.8.2 Foundation wall drainage.** Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1807.4.2 and 1807.4.3.

**1805.5.8.3 Reserved.**

**1805.6 Reserved.**

**1805.7 Reserved.**

**1805.8 Reserved.**

**1805.9 Seismic requirements.** For structures assigned to Seismic Design Category C or D, provisions of ACI 318 Section 21.12, as modified by Section 1805 of this code, shall apply when not in conflict with the provisions of Section 1805 of this code. Concrete shall have a specified compressive strength of not less than 3,000 psi (20.68 MPa) at 28 days.

**Exceptions:**

1. Group R or U occupancies of light-framed construction and two stories or fewer in height are permitted to use concrete with a specified compressive strength of not less than 2,500 psi (17.2 MPa) at 28 days.
2. One and two-family dwellings not more than three stories in height are not required to comply with the provisions of ACI 318, Sections 21.10.1 through 21.10.3.



## SECTION BC 1806 RETAINING WALLS AND OTHER RETAINING STRUCTURES

**1806.1 General.** Retaining walls shall be designed in accordance with Sections 1806.2.

**1806.2 Design.** Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the sliding analysis.

**1806.2.1 Design lateral soil loads.** Retaining walls shall be designed for the lateral soil loads set forth in Section 1605.

**Exception:** Where the structural design of a retaining wall is based on load factor design, the load factors in Section 1605.2 may be modified as follows: where water can freely flow over the top of the wall, the wall may be designed for a water pressure equal to that caused by a groundwater table elevation at the top of the wall. For this condition, the load factor for the groundwater pressure may be reduced to 1.2. The load factor for the lateral earth pressure shall remain at 1.6.

**1806.2.2 Safety factor.** Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605 shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 1.0 times other nominal loads, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

**Exception:** Where earthquake loads are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.

**1806.3 Temporary retaining structures.** Structural members for temporary retaining structures may be designed with a 20 percent decrease in the computed bending moment only.

## SECTION BC 1807 DAMPPROOFING AND WATERPROOFING

**1807.1 Where required.** Walls or portions thereof that retain soil or rock and enclose interior spaces and floors below grade shall be waterproofed or dampproofed in accordance with this section, with the exception of those spaces containing occupancy groups other than residential and institutional where such omission is not detrimental to the building or occupancy. Ventilation for crawl spaces shall comply with Section 1203.3.

**1807.1.1 Flood hazard areas.** Buildings and structures in areas of special flood hazard shall comply with Appendix G.

**1807.2 Dampproofing required.** Where hydrostatic pressure will not occur as determined by Section 1802, floors and

walls for other than wood foundation systems shall be dampproofed in accordance with this section. Wood foundation systems shall be constructed in accordance with AF&PA TR7.

**1807.2.1 Floors.** Dampproofing materials for floors shall be installed between: (i) the floor and (ii) the base course required by Section 1807.4.1 or the sub-floor. Subgrade for the dampproofing material shall be prepared in accordance with manufacturer's recommendations. Dampproofing material shall be installed in accordance with manufacturer's recommendations, and protected after placement. Any damaged areas and punctures must be repaired prior to placement of slab. All penetrations shall be sealed as per manufacturer's recommendations.

**1807.2.2 Walls.** Dampproofing materials for walls shall be installed on the exterior surface of the wall, and shall extend from the top of the footing to above ground level as determined by the registered design professional and shall be installed in accordance with manufacturer's recommendations. Dampproofing at walls shall overlap or extend past the slab dampproofing such that there are no gaps or breaches in the dampproofing system.

**1807.3 Waterproofing required.** Where the geotechnical investigation required by Section 1802 indicates that a hydrostatic pressure condition exists, walls and floors shall be waterproofed in accordance with this section.

**1807.3.1 Floors.** Floors required to be waterproofed shall be designed and constructed to withstand the hydrostatic pressures to which the floors will be subjected. Waterproofing shall be accomplished by creating a continuous water seal below the floor using appropriate waterproofing materials. Joints, penetrations and other interruptions shall be sealed in accordance with manufacturer's recommendations. Floor waterproofing must be transitioned to accomplish a complete tie-in with the foundation wall waterproofing.

**1807.3.2 Walls.** Walls required to be waterproofed shall be designed and constructed to withstand the hydrostatic pressures and other lateral loads to which the walls will be subjected. Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the groundwater table or as directed by the registered design professional. The remainder of the wall shall be dampproofed in accordance with Section 1807.2.2. Joints, penetrations and other interruptions shall be sealed in accordance with manufacturer's recommendations.

**1807.3.3 Joints and penetrations.** Joints in or between walls and floors, and penetrations of walls and floors shall be sealed utilizing methods and materials approved by the registered design professional. Joints, penetrations and other interruptions shall be sealed in accordance with the manufacturer's recommendations.

**1807.4 Subsoil drainage system.** Where it is determined that there is a potential for infiltration or seepage, a subsoil drainage system shall be permitted to be used to control this inflow, provided that:

1. The below ground space is waterproofed or damp-proofed per Sections 1807.2 and 1807.3; and
2. The estimated discharge from the drainage system is less than or equal to the amount allowed by the agency having jurisdiction.

**1807.4.1 Drainage course.** A drainage course shall consist of washed gravel, crushed natural stone or other suitable drainage medium acceptable to the engineer. Recycled concrete aggregate is not acceptable for use in a drainage course where a subsoil drainage system is used.

**1807.4.2 Foundation drain.** A foundation drain shall be installed where required by the registered design professional. The foundation drain, including layout, materials, and cleanouts, shall be designed by the registered design professional.

**1807.4.3 Drainage discharge.** The drainage course and foundation drain shall discharge by gravity or mechanical means into an approved drainage system that complies with the *New York City Plumbing Code* and any other laws or requirements of agencies having jurisdiction.

**1807.5 In situ walls.** In situ walls (such as slurry walls, tangent pile walls, and secant pile walls) with joints sealed by grouting or other methods acceptable to the engineer shall not require waterproofing or dampproofing unless required by the engineer.

## SECTION BC 1808 DEEP FOUNDATIONS

**1808.1 Scope.** Deep foundation elements, including but not limited to piles, caisson piles, and helical piles, shall comply with Section 1808. In addition, driven piles shall comply with Section 1809; cast-in-place concrete piles shall comply with Section 1810; composite piles shall comply with Section 1811; and helical piles shall comply with Section 1812.

### 1808.2 Piles—general requirements.

**1808.2.1 General.** Piles shall be designed and installed in accordance with the requirements of the geotechnical investigation and report required by Section 1802 and Sections 1808 through 1812.

**1808.2.2 Additional geotechnical investigation and report requirements.** Where pile foundations are used, the geotechnical investigation and report provisions of Section 1802 shall be expanded to include, but not be limited to, consideration of the following:

1. Suitable pile types and installed capacities.
2. Suitable center-to-center spacing of deep foundation elements.
3. Driving criteria.
4. Installation procedures.
5. Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity where required).
6. Pile load test requirements.
7. Durability of pile materials.

8. Designation of bearing stratum or strata.

9. Reductions for group action, where necessary.

**1808.2.3 Special inspection.** Special inspections for deep foundations shall be performed by an engineer in accordance with Sections 1704.8 and 1704.9.

**1808.2.4 Pile caps.** Pile caps shall be of reinforced concrete, and shall include all elements to which piles are connected, including grade beams and mats. The soil immediately below the pile cap shall not be considered as carrying any vertical load. The tops of piles shall be embedded not fewer than 3 inches (76 mm) into pile caps and the caps shall extend at least 4 inches (102 mm) beyond the edges of piles. The tops of piles shall be cut back to sound material before capping. Pile caps shall be protected from the effects of frost in accordance with Section 1805.3.1.

**1808.2.5 More than one pile type, pile capacity or method of pile installation.** In the conditions described below, the several parts of the building supported on the different pile types or different pile capacities, shall be separated by suitable joints providing for differential movement, or analysis shall be prepared by the engineer, establishing to the satisfaction of the commissioner that the proposed construction is adequate and safe, and showing that the probable settlements and differential settlements to be expected will be tolerable to the structure and not result in instability of the building. The load test requirements of Section 1808.4 shall apply separately and distinctly to each different type or capacity of piling or equipment used, or method of installation, except where analysis of the probable, comparative behavior of the different type or capacity of the piling or the method of installation indicates that data on one type or capacity of piling permit a reliable extrapolation of the probable behavior of the piling of other types or capacities. The requirements of this section apply to the following proposed conditions:

1. Construction of a foundation for a building utilizing piles of more than one type or capacity;
2. Modification of an existing foundation by the addition of piles of a type or capacity other than those of the existing piling;
3. Construction or modification of a foundation utilizing different methods or more than one method of installation, or using different types or capacities of equipment (such as different types of hammers having markedly different striking energies or speeds); or
4. Support of part of a building on piles and part on footings.

**1808.2.6 Settlement analysis.** The settlement of individual piles or groups of piles shall be estimated based on approved methods of analysis. The predicted settlement shall cause neither harmful distortion of, nor instability in, the structure, nor cause any stresses to exceed allowable values.

**1808.2.7 Use of existing piles.** Piles left in place where a structure has been demolished shall not be used for the support of new construction unless the piles are load tested, original installation and testing records are available, or the new loads are no more than half the calculated previous loads on the piles. The engineer shall determine and certify that the piles are sound and meet the requirements of this code.

**1808.2.8 Special types of piles.** The use of types of piles not specifically mentioned herein is permitted, subject to the approval of the commissioner, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such piles. The allowable stresses shall not in any case exceed the limitations specified herein.

**1808.2.9 Minimum spacing of piles.** Minimum spacing of piles shall: (i) provide for adequate distribution of the load on the pile group into the supporting soil or rock, (ii) account for installation effects, and (iii) be in accordance with Section 1808.2.2.

**1808.2.10 Piles located near a lot line.** Piles located near a lot line shall be designed on the assumption that the adjacent lot will be excavated to a depth of 10 feet (3048 mm) below the nearest legally established curb level. Where such excavation would reduce the embedded length of the pile, the portion of the pile exposed shall be deemed to provide no lateral or vertical support, and the load-carrying determination shall discount the resistance offered by the soil that is subject to potential excavation.

**1808.2.11 Splices.** Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the pile during installation and thereafter and shall be of adequate strength to transmit the vertical and lateral loads (including tensions) and the moments occurring in the pile section at the location of the splice without exceeding the allowable stresses for such materials as established in Table 1808.8. In all cases splices shall develop at least 50 percent of the capacity of the pile in bending. In all cases pile splices situated in the upper 10 feet (3048 mm) of the pile shall be capable of resisting (at allowable working stresses) the applied moments and shears. For individual piles or groups comprised of two piles, splices in the upper 10 feet also shall be capable of resisting the moment and shear that would result from an assumed eccentricity of the pile load of 3 inches (76 mm). For piles located near a lot line, the applied moment and shears of such piles shall be determined on the basis that the adjacent site will be excavated to a depth of 10 feet (3048 mm) below the nearest established curb level as required in Section 1808.2.10.

**Exception:** For caissons core beams, the splice shall develop the lesser of 50 percent of the capacity of the core in bending or twice the design bending moment carried by the core at the location of the splice, provided that the core splice is not within two caisson diameters of any splice in the casing.

**1808.2.12 Protective treatment of pile materials.** Where boring records or site conditions indicate possible deleteri-

ous action on pile materials because of soil constituents or other aggressive environmental factors (such as chemical seepage, the presence of salt water, electrical current, changing water levels or other factors), the pile materials shall be adequately protected by materials, methods or processes approved by the engineer. Protective materials shall be applied to the piles so as not to be rendered ineffective by driving. The effectiveness of such protective measures for the particular purpose shall have been thoroughly established by satisfactory service records or other evidence.

Piles installed in ash, garbage, or cinder fills; piles that are free-standing in or near a seawater environment; piles used for the support of chemical plants or coal storage; piles under similar conditions of chemical seepage or aggressive action; and piles that are used for support of electrical generating plants, shall be investigated regarding the need for special protective treatment. Where special protective treatment is indicated by the engineer, such piles shall be protected against deterioration by encasement, coating or other device acceptable to the engineer.

**1808.2.13 Minimum concrete cover.** The minimum concrete cover for cast-in-place and precast concrete piles shall be as shown in Table 1808.2.13.

**TABLE 1808.2.13**  
**MINIMUM CONCRETE COVER FOR CAST IN PLACE AND**  
**PRECAST CONCRETE PILES<sup>a</sup>**

FOUNDATION ELEMENT OR CONDITION	MINIMUM COVER
1. Precast nonprestressed deep foundation elements Exposed to seawater Not manufactured under plant conditions Manufactured under plant control conditions	3 inches 2 inches In accordance with Section 7.7.3 of ACI 318
2. Precast prestressed deep foundation elements Exposed to seawater Other	2.5 inches In accordance with Section 7.7.3 of ACI 318
3. Cast-in-place deep foundation elements not enclosed by a steel pipe, tube or permanent casing	2.5 inches
4. Cast-in-place deep foundation elements enclosed by a steel pipe, tube or permanent casing	1 inch
5. Structural steel core within a steel pipe, tube or permanent casing	2 inches
6. Cast-in-place drilled shafts enclosed by a stable rock socket	1.5 inches

For SI: 1 inch = 25.4 mm.

- a. The concrete cover provided for prestressed and nonprestressed reinforcement in foundations shall be no less than the largest applicable value specified in Table 1808.2.13. Longitudinal bars spaced less than 1½ inches (38 mm) clear distance apart shall be considered bundled bars for which the concrete cover provided shall also be no less than that required by Section 7.7.4 of ACI 318. Concrete cover shall be measured from the concrete surface to the outermost surface of the steel to which the cover requirement applies. Where concrete is placed in a temporary or permanent casing or a mandrel, the inside face of the casing or mandrel shall be considered the concrete surface.



**1808.3 Allowable pile loads.** Allowable pile loads shall be determined in accordance with Sections 1808.3.1 through 1808.3.5.

**1808.3.1 Determination of allowable individual axial compressive loads.** The allowable individual axial compressive loads on piles shall be the lesser of the allowable structural capacity of the element and the allowable geotechnical capacity of the element. This allowable load shall be determined by an engineer experienced in geotechnical engineering and shall be approved by the commissioner as described below:

1. The allowable structural capacity of the pile shall be determined in accordance with Sections 1808 through 1813 of this code.
2. The allowable geotechnical capacity of the pile shall be calculated using a recognized method of analysis, and a minimum factor of safety of 2 with respect to failure.
3. The allowable geotechnical capacity shall be demonstrated by load tests.

**Exceptions:**

1. Allowable loads for piles installed by jacking shall be determined in accordance with Section 1808.3.2.
2. Caissons socketed into Class 1a through 1c material as defined in Table 1804.1.
3. Driven piles with allowable loads less than or equal to 40 tons (30 tons for timber piles).
4. Micropiles with allowable loads less than or equal to 20 tons, provided all of the following criteria are satisfied:
  - 4.1. The maximum allowable bond stress between the soil and the grout is less than or equal to 4 psi.
  - 4.2. The minimum bond zone diameter is greater than or equal to 9 inches (228.6 mm).
  - 4.3. The bond zone is formed entirely in Class 3b or better soils.

**1808.3.1.1 Group effects.** The allowable load determined in Section 1808.3.1 shall account for pile group effects. The analysis of group effects shall be performed by an engineer experienced in geotechnical engineering and calculated using recognized methods of analysis. This analysis shall include a bearing capacity and settlement analysis of the anticipated pile groups and shall consider the presence of weaker soil strata that may be present below the element.

**1808.3.1.2 Down-drag.** Where piles are installed through subsiding fills or other subsiding strata and derive support from underlying firmer materials, consideration shall be given to the downward frictional forces that may be imposed on the piles by the subsiding upper strata.

**1808.3.1.3 Bearing stratum.** The plans for the proposed work shall establish, in accordance with the requirements relating to allowable bearing pressure, the bearing stratum to which the piles in the various sections of the building must penetrate and the approximate elevations of the top of such bearing stratum. Where penetration of a given distance into the bearing strata is required for adequate distribution of the loads, such penetration shall be shown on the plans. The indicated elevations of the top of the bearing strata shall be modified by such additional data as may be obtained during construction. All piles shall penetrate to or into the designated bearing stratum.

**1808.3.2 Piles installed by jacking or other static forces.** The allowable capacity of a pile installed by jacking or other static forces shall be not more than 50 percent of the load or force used to install the pile to the required penetration, except for piles jacked into position for underpinning. The allowable capacity of each permanent underpinning pile shall not exceed the larger of the following values:  $\frac{2}{3}$  of the total jacking force used to obtain the required penetration if the load is held constant for 7 hours without measurable settlement; or  $\frac{1}{2}$  of the total jacking force at final penetration if the load is held for a period of 1 hour without measurable settlement. The jacking resistance used to determine the working load shall not include the resistance offered by nonbearing soils, soils which are to be excavated or soils where support will dissipate with time.

**1808.3.3 Helical piles.** The allowable axial compressive load for helical piles shall be in accordance with the requirements of Section 1812.

**1808.3.4 Allowable uplift load.** Where required by the design, the allowable uplift load for a single pile shall be determined in accordance with accepted engineering practices based on a minimum factor of safety of three or by uplift load tests performed in accordance with Section 1808.4.2.1. Where uplift load tests are performed, the maximum allowable uplift load shall not exceed the ultimate load capacity divided by a factor of safety of two. The allowable uplift load for a pile group shall not exceed the sum of the allowable uplift loads of the individual piles in the group, nor the uplift capacity calculating the group action of the pile in accordance with accepted engineering practice where the calculated ultimate group capacity is divided by a safety factor of 2.5.

**1808.3.5 Allowable lateral load.** The allowable lateral load of a single pile or a pile group shall be determined by an approved method of analysis in accordance with accepted engineering practice. The maximum allowable lateral load of a pile shall be 1 ton (8.9 kN), unless verified by lateral load test. Load testing, where required, shall be in accordance with Section 1808.4.3. See Sections 1808.4.3.1 and 1808.4.3.2 for determining the allowable lateral load from the results of lateral load tests.

**1808.3.5.1 Group effects.** Lateral capacities for pile groups shall be modified to account for group effects in accordance with accepted engineering practice.



**1808.4 Load tests.** Where required, piles shall be load tested in accordance with the requirements of Sections 1808.4.1 through 1808.4.3.

**1808.4.1 Compressive load tests.** Where load tests are required per Section 1808.3 or 1808.4.1.1.1, the piles shall be load tested in accordance with the applicable section.

**1808.4.1.1 Required number of load tests.** Where load tests are required, at least one test shall be performed in each area of the foundation site within which the subsurface soil conditions are “substantially similar” in character, as determined by the engineer, and at least one test shall be performed for each pile type for the entire foundation installation of the building or group of buildings on a site occupying a total area of 5,000 square feet (465 m<sup>2</sup>) or less. Where load tests are required, at least two load tests shall be performed for a site having a footprint between 5,000 square feet (465 m<sup>2</sup>) and 30,000 square feet (2787 m<sup>2</sup>), and one additional load test shall be performed for each 20,000 square feet (1860 m<sup>2</sup>) of added footprint area. For conditions where multiple pile types or capacities are used, refer to Section 1808.2.5.

**1808.4.1.1.1 Additional load tests.** Where installed pile capacities are in doubt, the piles are considered non-conforming by the engineer, or as required by the commissioner, additional piles shall be load tested to establish the allowable capacity. For friction piles where the actual production pile lengths vary more than 25 percent from that of the test pile, the engineer shall determine if additional load tests are required to establish the allowable pile capacity. The number of additional load tests shall be determined by the engineer or commissioner.

**1808.4.1.2 Load test apparatus and inspection requirements.** The apparatus and structure to be used in making the load test shall be designed by an engineer. Load tests shall be performed under the observation of the special inspector. A complete record of such tests shall be filed with the commissioner.

**1808.4.1.3 Compressive load test procedures.** Compressive load tests shall be conducted in accordance with ASTM D 1143 standard procedures and the following conditions:

1. Dial extensometer gages shall provide readings to the nearest 0.001 inch (0.025 mm). Electrical transducers may be used to make settlement observations, provided that backup measurements are made utilizing dial extensometers as described herein at sufficient times to validate the transducer readings.
2. If the allowable axial compressive load is less than or equal to the Basic Maximum Allowable Pile Load in Table 1808.4.1.3, the total test load shall remain in place for a minimum of 12 hours, and shall be held until the average rate of settlement as measured over a 12-hour period does not exceed 0.001 inches (0.025 mm) per hour. The total load shall be removed in decrements not

exceeding 25 percent of the total load at 1 hour intervals or longer. For cases where the allowable pile load is greater than the values prescribed in Table 1808.4.1.3, refer to Section 1808.4.1.5.

3. In addition to observations required by ASTM D 1143, settlement observations shall be performed 24 hours after the entire test load has been removed.

**Exception:** A static load test for drilled piles using an embedding load transfer mechanism shall be considered acceptable, provided that the test is performed in general accordance with ASTM D 1143 – Quick Load Test Method. The pile shall be suitably instrumented to evaluate the load transfer through soil or rock at multiple locations along the shaft.

4. Any temporary supporting capacity that the soil might provide to the pile during a load test, but which would be dissipated with time, shall be eliminated by casing off or by other suitable means, such as increasing the total test load to account for such temporary capacity.

**TABLE 1808.4.1.3  
BASIC MAXIMUM ALLOWABLE PILE LOADS**

TYPE OF PILE	MAXIMUM ALLOWABLE PILE LOAD (TONS)
<b>Caisson Piles</b>	<b>No upper limit</b>
Open-end pipe (or tube) piles bearing on rock of Class 1a, 1b, or 1c	18-in O.D. and greater 250
	14-in to 18-in O.D. 200
	12-in to 14-in O.D. 150
	10-in to 12-in O.D. 100
	8-in to 10-in O.D. 60
Closed-end pipe (or tube) piles, H-piles, cast-in-place concrete, enlarged base piles, and precast concrete piles bearing on rock of Class 1a, 1b, or 1c	150
Piles (other than timber or helical piles) bearing on soft rock of Class 1d	80
Piles (other than timber or helical piles) that receive their principal support other than by direct bearing on rock of Class 1a through 1d	75
Timber piles bearing on rock of Class 1a through 1d	25
Timber piles bearing in suitable soils	40 tons maximum permissible with load test, 30 tons maximum without load test.
Helical piles	30 tons maximum permissible

For SI: 1 ton = 907.18 kg.

**1808.4.1.4 High strain, dynamic compressive test methods.** High strain, dynamic compressive test methods performed in accordance with ASTM D 4945 shall be permitted to be used where three or more load tests are required and subject to the approval of the commissioner. In such case, at least one high strain dynamic test shall be performed as a calibration on a static load tested pile or nearby pile driven to comparable resistance. No more than one-half of the required number of load tests may be performed by high strain dynamic

methods. High strain dynamic tests shall be performed under the supervision of an engineer experienced in the methods used. The number of high strain dynamic tests shall be at least twice the number of replaced static load tests.

**1808.4.1.5 Acceptance criteria.** The allowable pile load shall be the lesser of the two values computed as follows:

1. Fifty percent of the applied load causing a net settlement of the pile of not more than  $\frac{1}{100}$  of 1 inch per ton (0.25 mm per 8.9 kN) of applied load. Net settlement in this paragraph is defined as gross settlement due to the total test load minus the rebound after removing 100 percent of the test load.
2. Fifty percent of the applied load causing a net settlement of the pile of  $\frac{3}{4}$  inch (19 mm). Net settlement in this paragraph is defined as the gross settlement due to the total test load less the amount of elastic shortening in the pile section due to total test load. The elastic shortening shall be calculated as if the pile is designed as an end-bearing pile or as a friction pile. Alternatively, the net settlement may be measured directly using a telltale or other suitable instrumentation.

**1808.4.1.5.1 Substantiation of higher allowable loads.** The basic maximum allowable pile loads tabulated in Table 1808.4.1.3 may be exceeded where a higher value can be substantiated on the basis of load tests and analysis, except for the loads for timber and helical piles. The provisions of Section 1808.4.1 shall be supplemented, as follows: the final load increment shall remain in place for a total of not less than 24 hours; single test piles shall be subjected to cyclical loading or suitably instrumented with telltales and strain gauges so that the movements of the pile tip and butt may be independently determined and load transfer to the soil evaluated. A complete record demonstrating satisfactory performance of the test shall be submitted to the commissioner.

**1808.4.2 Uplift load test.** Where uplift load tests are required, one uplift load test shall be conducted in each area of substantially similar subsurface conditions up to 5,000 square feet (465 m<sup>2</sup>) of building footprint where piles are subjected to uplift, and not less than two uplift load tests shall be conducted for each area of building footprint where piles are subjected to uplift between 5,000 square feet (465 m<sup>2</sup>) and 30,000 square feet (2787 m<sup>2</sup>) and for such area one additional upload load test shall be conducted for each 20,000 square feet (1860 m<sup>2</sup>) of additional area of building footprint where piles are subject to uplift. For conditions where multiple pile types or capacities are used, refer to Section 1808.2.5.

**1808.4.2.1 Uplift load test procedures.** Uplift load tests shall be conducted in accordance with ASTM D 3689 standard procedures and the following conditions:

1. Dial extensometer gages shall provide readings to the nearest 0.001 inch (0.025 mm). Electrical transducers may be used to make settlement observations provided that backup measurements are made utilizing dial extensometers as described herein at sufficient times to validate the transducer readings.
2. Any temporary supporting capacity that the soil might provide to the pile during a load test, but which would be dissipated with time, shall be eliminated by casing off or by other suitable means, such as increasing the total test load to account for such temporary capacity.

**1808.4.2.2 Uplift load test apparatus and inspection requirements.** The apparatus and structure to be used in making the load test shall be designed by an engineer. Load tests shall be performed under the observation of the special inspector. A complete record of such tests shall be filed with the commissioner.

**1808.4.3 Lateral load tests.** Where testing is required, lateral load tests shall be performed in accordance with ASTM D 3966. A minimum of two piles shall be tested for every area of similar subsurface conditions. For conditions where multiple pile types or capacities are used, refer to Section 1808.2.5.

**1808.4.3.1 Free headed piles.** For piles whose heads are to be designed to be free to rotate in the final structure, the maximum test load shall be at least twice the proposed design working load. In the absence of specific project requirements as determined by the engineer, the resulting allowable load shall not be more than one-half of that test load that produces a gross lateral movement of 1 inch (25 mm) at the ground surface.

**1808.4.3.2 Fixed headed piles.** For piles whose heads are designed to be fixed in the final structure, the results of the load test shall be used to verify the input parameters used in the lateral load analysis. In the absence of specific project requirements as determined by the engineer, the allowable load shall be the load that produces a gross lateral movement of  $\frac{3}{8}$  of an inch at the ground surface in the lateral load analysis.

**1808.4.3.3 Lateral load test procedures.** Lateral load tests shall be conducted in accordance with ASTM D 3966 standard procedures. In addition, dial extensometer gages shall provide readings to the nearest 0.001 inch (0.025 mm). Electrical transducers may be used to make deflection observations, provided that backup measurements are made utilizing dial extensometers as described herein at sufficient times to validate the transducer readings.

**1808.4.3.4 Load test apparatus and inspection requirements.** The apparatus and structure to be used in making the load test shall be designed by an engineer. Lateral load tests shall be performed under the observation of the special inspector. A complete record of such tests shall be filed with the commissioner.

**1808.5 Installation.** Installation of piles shall be subject to the requirements of Sections 1808.5.1 through 1808.5.8.

**1808.5.1 Protection of piles during installation.** Piling shall be handled and installed to the required penetration and resistance by methods that leave the piles' strength unimpaired and that develop and retain the piles' required load-bearing resistance. Any damaged pile shall be satisfactorily repaired or the pile shall be rejected. As an alternative and subject to the approval by the commissioner, damaged or misaligned piles or piles not reaching design tip elevation may be used at a reduced fraction of the design load based on an analysis by the engineer.

**1808.5.2 Equipment.** Equipment and methods of installation shall be such that piles are installed in their proper position and alignment, without damage. Equipment shall be maintained in good working order.

**1808.5.3 Preexcavation.** The use of jetting, augering or other methods of preexcavation shall be subject to the approval of the commissioner. Where permitted, preexcavation shall be carried out in the same manner as used for piles subject to load tests and in such a manner that will not impair the carrying capacity of the piles already in place or damage adjacent structures. Pile tips shall be driven below the preexcavated depth until the required resistance or penetration is obtained.

**1808.5.4 Minimum pile penetrations.** Piles shall penetrate the minimum distance required to develop the required load capacity of the pile as established by the required penetration resistance and load tests as applicable.

**1808.5.5 Damage to adjacent structures or piles.** Piles shall be installed in such a manner and sequence as to prevent distortion or damage that affects the structural integrity of the piles being installed, or previously installed adjacent piles. The sequence of the installation shall avoid compacting the surrounding soil to the extent that other piles cannot be installed properly, and shall prevent ground movements that are capable of damaging adjacent structures. Piles shall be installed with adequate provision for the protection of adjacent buildings and property.

**1808.5.6 Identification.** All pile materials shipped or delivered to the job site shall be identified for conformity to the specified grade and this identification shall be maintained continuously from the point of manufacture to the point of installation. Such shipment or delivery shall be accompanied by a certification from the material supplier or manufacturer indicating conformance with the construction documents. Such certification shall be made available to the engineer of record and the department. In the absence of adequate data, pile materials shall be tested by an approved agency to determine conformity to the specified grade. The approved agency shall furnish a certification of compliance to the engineer of record, or upon request to the commissioner.

**1808.5.7 Pile location plan.** A plan showing the location and designation of piles by an identification system shall be filed with the commissioner prior to installation of such piles. Detailed records for individual piles shall bear an identification corresponding to that shown on the plan.

**1808.5.8 Installation of piles.** Piles within the area of influence of a given, satisfactorily tested pile shall be installed to the same installation criteria as the successful test pile. The same equipment that was used to install the test pile, identically operated in all aspects, shall be used to install the piles. All piles shall be of the same type, size and shape as the test pile. All piles within the area of influence as represented by a given satisfactorily tested test pile shall bear in, or on, the same bearing stratum as the test pile.

**1808.6 Tolerances.** Tolerances for piles shall be in accordance with the requirements of Sections 1808.6.1 through 1808.6.4.

**1808.6.1 Tolerance in the location of the head of the pile.** A tolerance of 3 inches (76 mm) from the designed location shall be permitted in the installation of each pile as measured from the pile head, without reduction in load capacity of the pile group unless otherwise noted on the foundation plans. When piles are installed outside of this tolerance, the true loading on such piles shall be analytically determined from a survey that defines the actual location of the piles as installed and using the actual eccentricity in the pile group with respect to the line of action of the applied load.

**1808.6.2 Out of plumb tolerance.** If the axis of any pile is installed out of plumb or deviates from the specified batter by more than 4 percent, the design of the foundation shall be modified to resist the resulting vertical and lateral forces. In types of piles for which subsurface inspection is not possible, this determination shall be made on the exposed section of the pile, which section, at the time of checking axial alignment, shall not be less than 2 feet (610 mm) in length. In piles that can be checked for axial alignment below the ground surface, the sweep of the pile axis shall not exceed 4 percent of the embedded length.

**1808.6.3 Bent piles.** The load-bearing capacity of piles discovered to have a sharp or sweeping bend shall be determined using an approved method of analysis by the engineer responsible for the pile design in accordance with accepted engineering practice or by load testing a representative pile.

**1808.6.4 Mislocated piles.** The maximum compressive load on any pile due to mislocation shall not exceed 110 percent of the allowable design load. If the total load on any pile, so determined, is in excess of 110 percent of the allowable load-bearing capacity, correction shall be made by installing additional piles or by other methods of load distribution as required to reduce the maximum pile load to 110 percent of the allowable pile capacity.

**1808.7 Lateral support.** Lateral support for piles shall be in accordance with the requirements of Sections 1808.7.1 through 1808.7.4.

**1808.7.1 Buckling of piles.** Any soil other than soil with no shear strength shall be deemed to afford sufficient lateral support to the pile to prevent buckling and to permit the design of the pile in accordance with accepted engineering practice and the applicable provisions of this code.

**1808.7.2 Unbraced piles.** Piles standing unbraced in air, water or soils with no shear strength shall be designed as columns in accordance with the provisions of this code. Such piles driven into firm ground can be considered fixed and laterally supported at 5 feet (1524 mm) below the ground surface and in soft material at 10 feet (3048 mm) below the ground surface unless otherwise prescribed by the engineer.

**1808.7.3 Bracing at tops of piles.** Piles shall be braced to provide lateral stability and resist eccentric loads and moments in all directions. Three or more piles connected by a rigid cap shall be considered braced, provided that the piles are located in radial directions from the centroid of the group not less than 60 degrees (1 rad) apart. A two-pile group in a rigid cap shall be considered to be braced along the axis connecting the two piles. Methods used to brace piles shall be subject to the approval of the commissioner.

Piles supporting walls shall be driven alternately in lines spaced at least 1 foot (305 mm) apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and moments due to lateral forces, or the wall piles are adequately braced. A single row of piles without bracing is permitted for one and two-family dwellings and

lightweight construction not exceeding two stories or 35 feet (10 668 mm) in height, provided the centers of the piles are located within the width of the wall.

**1808.7.4 Bracing of short piles.** All pile caps supported by piles that penetrate less than ten feet below cutoff level or less than ten feet below ground level shall be braced against lateral movement. Such bracing may consist of connection to other pile caps that encompass piles embedded more than ten feet below those levels. The heads of the piles shall be fixed in the cap. In no case shall more than fifty percent of the piles in the foundation of any building penetrate less than ten feet below cut-off level or less than ten feet below ground level.

**Exception:** The requirements of this section shall not apply to caisson piles.

**1808.7.4.1 Piles located near a lot line.** Where the embedded length of piles located near a lot line would be reduced to less than ten feet by excavation of the adjacent site to a depth of ten feet below the nearest established curb level, the provisions of Section 1808.7.4 shall apply.

**1808.8 Allowable stresses.** Allowable stresses for piles shall be as listed in Table 1808.8.

**TABLE 1808.8**  
**ALLOWABLE STRESSES FOR MATERIALS USED IN PILES**

MATERIAL TYPE AND CONDITION	MAXIMUM ALLOWABLE STRESS <sup>a</sup>
1. Concrete or grout in compression <sup>b</sup> Cast-in-place with a permanent casing in accordance with Section 1810.5.2 Cast-in-place in a pipe, tube, other permanent casing or rock Cast-in-place without a permanent casing Precast nonprestressed Precast prestressed	$0.4 f'_c$ $0.33 f'_c$ $0.3 f'_c$ $0.33 f'_c$ $0.33 f'_c - 0.27 f_{pc}$
2. Nonprestressed reinforcement in compression	$0.4 f_y \leq 30,000$ psi
3. Structural steel in compression Cores within concrete-filled pipes or tubes Pipes, tubes or H-piles, where justified in accordance with Section 1808.2.10 Pipes or tubes for micropiles Other pipes, tubes or H-piles Helical piles	$0.5 F_y \leq 32,000$ psi $0.5 F_y \leq 32,000$ psi $0.4 F_y \leq 32,000$ psi $0.35 F_y \leq 16,000$ psi $0.6 F_y \leq 0.5 F_u$
4. Nonprestressed reinforcement in tension Within micropiles or caissons less than 14 inches in diameter Other conditions	$0.6 f_y$ $0.5 f_y \leq 24,000$ psi
5. Structural steel in tension Structural steel cores in caisson piles, Pipes, tubes or H-piles, where justified in accordance with Section 1808.2.10 Other pipes, tubes or H-piles Helical piles	$0.5 F_y \leq 32,000$ psi $0.5 F_y \leq 32,000$ psi $0.35 F_y \leq 16,000$ psi $0.6 F_y \leq 0.5 F_u$
6. Timber	See Section 1809.5.4

For SI: 1 pound per square inch = 6.895 kPa.

a.  $f'_c$  is the specified compressive strength of the concrete or grout;  $f_{pc}$  is the compressive stress on the gross concrete section due to effective prestress forces only;  $f_y$  is the specified yield strength of reinforcement;  $F_y$  is the specified minimum yield stress of structural steel;  $F_u$  is the specified minimum tensile stress of structural steel.

b. The stresses specified apply to the gross cross-sectional area within the concrete surface. Where a temporary or permanent casing is used, the inside face of the casing shall be considered the concrete surface.



**1808.8.1 Allowable stresses for piles.** Allowable stresses for designing piles shall be as specified in Table 1808.8.

**Exception:** Allowable stresses greater than those specified in Table 1808.8 in Sections 1809 and 1810 shall be permitted where supporting data justifying such higher stresses are filed and approved by the commissioner.

## 1808.9 Seismic Design Categories C & D.

**1808.9.1 Seismic design of piles.** Seismic design of piles shall be performed in accordance with Sections 1808.9.1 through 1808.9.3.

**1808.9.2 Seismic Design Category C.** Where a structure is assigned to Seismic Design Category C in accordance with Section 1613, individual pile caps or piles shall be interconnected by ties. Ties shall be capable of carrying, in tension and compression, a force equal to the lesser of: (i) the product of the larger of the pile cap or column design gravity load times the seismic coefficient,  $S_{DS}$ , divided by 10, or (ii) 25 percent of the smaller of the pile or column design gravity load, unless it can be demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade, reinforced concrete slabs on grade, or confinement by competent rock, hard cohesive soils or very dense granular soils.

**1808.9.2.1 Connection to pile cap.** For structures assigned to Seismic Design Category C or D in accordance with Section 1613, concrete deep foundation elements shall be connected to the pile cap by embedding the element reinforcement or field-placed dowels anchored in the element into the pile cap for a distance equal to their development length in accordance with ACI 318. It shall be permitted to connect precast, prestressed piles to the pile cap by developing the element prestressing strands into the pile cap, provided the connection is ductile. For deformed bars, the development length is the full development length for compression, or tension in the case of uplift, without reduction for excess reinforcement in accordance with Section 12.2.5 of ACI 318. Alternative measures for laterally confining concrete and maintaining toughness and ductile-like behavior at the top of the element shall be permitted, provided the design is such that any hinging occurs in the confined region. The minimum transverse steel ratio for confinement shall not be less than one-half of that required for columns.

For resistance to uplift forces, anchorage of steel pipes, tubes or H-piles to the pile cap shall be made by means other than concrete bond to the bare steel section. Concrete-filled steel pipes or tubes shall have reinforcement of not less than 0.01 times the cross sectional area of the concrete fill, developed into the cap and extending into the concrete fill a length equal to two times the required cap embedment, but not less than the development length in tension of the reinforcement.

**Exception:** Anchorage of concrete-filled steel pipe piles is permitted to be accomplished using deformed bars developed into the concrete portion of the pile. Splices of pile segments shall develop

the full strength of the pile, but the splice need not develop the nominal strength of the pile in tension, shear and bending when the splice has been designed to resist axial and shear forces and moments from the load combinations of Section 12.4 of ASCE 7-10.

**1808.9.2.2 Design details.** Pile moments, shears and lateral deflections used for design shall be established considering the nonlinear interaction of the shaft and soil, as recommended by the engineer. Where the ratio of the depth of embedment of the pile-to-pile diameter or width is less than or equal to six, the pile may be assumed to be rigid. Pile group effects from soil on lateral pile nominal strength shall be included where pile center-to-center spacing in the direction of lateral force is less than eight pile diameters. Pile group effects on vertical nominal strength shall be included where pile center-to-center spacing is less than three pile diameters. The pile uplift soil nominal strength shall be taken as the pile uplift strength as limited by the frictional force developed between the soil and the pile.

Where a minimum length for reinforcement or the extent of closely spaced confinement reinforcement is specified at the top of the pile, provisions shall be made so that those specified lengths or extents are maintained after pile cutoff.

**1808.9.3 Seismic Design Category D.** Where a structure is assigned to Seismic Design Category D in accordance with Section 1613, the requirements for Seismic Design Category C given in Section 1808.9.2 shall be met. Provisions of ACI 318, Section 21.12.4, shall also apply when not in conflict with the provisions of Sections 1808 through 1813. Concrete shall have a specified compressive strength of not less than 3,000 psi (20.68 MPa) at 28 days.

### Exceptions:

1. Group R or U occupancies of light-framed construction and two stories or less in height are permitted to use concrete with a specified compressive strength of not less than 2,500 psi (17.2 MPa) at 28 days.
2. Detached one and two-family dwellings of light-frame construction and two stories or less in height are not required to comply with the provisions of ACI 318, Section 21.12.4.
3. Section 21.12.4(a) of ACI 318 shall not apply to concrete piles.

**1808.9.3.1 Design details for piles and grade beams.** Piles shall be designed and constructed to withstand maximum imposed curvatures from earthquake ground motions and structure response. Curvatures shall include free-field soil strains modified for soil-pile-structure interaction coupled with pile deformations induced by lateral pile resistance to structure seismic forces. Concrete piles on Site Class E or F sites, as determined in Section 1613.5.2, shall be designed and detailed in accordance with Sections 21.12.4.1, 21.12.4.2 and 21.12.4.3 of ACI 318 within seven pile

diameters of the pile cap and the interfaces of soft to medium stiff clay or liquefiable strata. For precast prestressed concrete piles, detailing provisions as given in Sections 1809.6.3.2.1 and 1809.6.3.2.2 shall apply. Grade beams shall be designed as beams in accordance with ACI 318, Chapter 21. When grade beams have the capacity to resist the forces from the load combinations in Section 1605.4, they need not conform to ACI 318, Chapter 21.

**1808.9.3.2 Connection to pile cap.** For piles required to resist uplift forces or provide rotational restraint, design of anchorage of piles into the pile cap shall be provided considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage into the pile cap shall be capable of developing the following:

1. In the case of uplift, the lesser of the nominal tensile strength of the longitudinal reinforcement in a concrete pile, or the nominal tensile strength of a steel pile, or the pile uplift soil nominal strength factored by 1.3 or the axial tension force resulting from the load combinations of Section 12.4 of ASCE 7-10.
2. In the case of rotational restraint, the lesser of the axial and shear forces, and moments resulting from the load combinations of Section 12.4 of ASCE 7-10 or development of the full axial, bending and shear nominal strength of the pile.

**1808.9.3.3 Flexural strength.** Where the vertical, lateral-force-resisting elements are columns, the grade beam or pile cap flexural strengths shall exceed the column flexural strength.

**1808.9.3.4 Batter piles.** The connection between batter piles and grade beams or pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connections shall be capable of resisting forces and moments from the load combinations of Section 12.4 of ASCE 7-10.

## SECTION BC 1809 DRIVEN PILES

**1809.1 General.** Driven piles shall be designed and installed in accordance with Sections 1808 and 1809.2 through 1809.7.

**1809.2 Equipment.** Equipment and methods of installation shall be such that piles are installed in their proper position and alignment, without damage. Equipment shall be maintained in good working order.

**1809.2.1 Pile driving hammer.** The hammer to be used to drive piles shall deliver a maximum energy consistent with the size, strength and weight of the driven piles. The

pile-driving hammer shall travel freely in the leads. The hammer shall deliver its rated energy, and measurements shall be made of the fall of the ram or other suitable data shall be obtained at intervals necessary to verify the actual energy delivered during the final 20 blows of the hammer.

**1809.2.2 Cushion or cap block.** The cushion or cap block shall be a solid block of hardwood with its grains parallel to the axis of the pile and enclosed in a tight-fitting steel housing, or other accepted equivalent assembly. If laminated materials are used, their type and construction shall be such that their strength is equal to or greater than hardwood. Wood chips, pieces of rope, hose, shavings, automobile tires or similar materials shall not be used. Cap block cushions shall be replaced if burned, crushed, or otherwise damaged. Other cushion materials may be used subject to the approval of the engineer. The introduction of fresh hammer cushion or pile cushion material just prior to final penetration is not permitted.

**1809.2.3 Followers.** Followers shall not be used unless permitted in writing by the engineer responsible for the pile driving operation. The required driving resistance shall account for the losses of driving energy transmitted to the pile because of the follower. The follower shall be a single length section, be provided with a socket or hood carefully fitted to the top of the pile to minimize loss of energy and to prevent damage to the pile, and have sufficient rigidity to prevent "whip" during driving.

**1809.3 Driving criteria.** The allowable compressive load on steel and concrete piles, where determined solely by the application of an approved wave equation analyses approved by the engineer, shall not exceed 40 tons (356 kN). The allowable compressive loads on timber piles, where determined solely by the wave equation analyses approved by the engineer, shall not exceed 30 tons (267 kN). For allowable loads greater than these values, the wave equation method of analysis may be used to establish initial driving criteria, but final driving criteria and the allowable load shall be verified by load tests in accordance with Section 1808.4. Minimum driving resistance and hammer energy may be determined in accordance with Tables 1809.3(a) and 1809.3(b).

**1809.3.1 Capacity as indicated by resistance to penetration.** Where subsurface investigation and general experience in the area indicate that the soil that must be penetrated by the pile consists of glacial deposits containing boulders, or fills containing rip-rap, excavated detritus, masonry, concrete or other obstructions in sufficient numbers to present a hazard to the installation of the piles, the selection of type of pile and penetration criteria shall be subject to the approval of the commissioner, but in no case shall the minimum penetration resistance be less than that stated in Tables 1809.3(a) and 1809.3(b).

**TABLE 1809.3(a)**  
**MINIMUM DRIVING RESISTANCE AND MINIMUM HAMMER ENERGY FOR STEEL H-PILES, PIPE PILES, PRECAST AND CAST-IN-PLACE CONCRETE PILES AND COMPOSITE PILES (other than timber)**

MINIMUM DRIVING RESISTANCE <sup>a, c, d, e</sup>				
Pile Capacity (tons)	Hammer Energy <sup>b</sup> (ft. lbs.)	Friction Piles (blows/ft.)	Piles Bearing on Soft Rock (Class 1d) (blows/ft.)	Piles Bearing on Rock (Class 1a, 1b, and 1c)
Up to 20	15,000	19	48	5 Blows per 1/4 inch (Minimum hammer energy of 15,000 ft. lbs.)
	19,000	15	27	
	24,000	11	16	
30	15,000	30	72	
	19,000	23	40	
	24,000	18	26	
40	15,000	44	96	
	19,000	32	53	
	24,000	24	34	
> 40	AS PER SECTION 1809.3			

For SI: 1 foot = 304.8 mm, 1 ton = 907.18 kg.

- Final driving resistance shall be the sum of tabulated values plus resistance exerted by nonbearing materials. The driving resistance of nonbearing materials shall be taken as the resistance experienced by the pile during driving, but which will be dissipated with time and may be approximated as described in Section 1809.3.
- The hammer energy indicated is the rated energy.
- Sustained driving resistance. Where piles are to bear in soft rock, the minimum driving resistance shall be maintained for the last 6 inches, unless a higher sustained driving resistance requirement is established by load test. Where piles are to bear in soil Classes 2 through 5, the minimum driving resistance shall be maintained for the last twelve inches unless load testing demonstrates a requirement for higher sustained driving resistance. No pile needs to be driven to a resistance that penetrates in blows per inch (blows per 25 mm) more than twice the resistance indicated in this table, nor beyond the point at which there is no measurable net penetration under the hammer blow.
- The tabulated values assume that the ratio of total weight of pile to weight of striking part of the hammer does not exceed 3.5. If a larger ratio is to be used, or for other conditions for which no values are tabulated, the driving resistance shall be as approved by the commissioner.
- For intermediate values of pile capacity, minimum requirements for driving resistance may be determined by straight line interpolation.

**TABLE 1809.3(b)**  
**MINIMUM DRIVING RESISTANCE AND HAMMER ENERGY FOR TIMBER PILES**

PILE CAPACITY (TONS)	MINIMUM DRIVING RESISTANCE (BLOWS/in.) TO BE ADDED TO DRIVING RESISTANCE EXERTED BY NONBEARING MATERIALS (NOTES 1, 3, 4)	HAMMER ENERGY (ft./lbs.) (Note 2)
Up to 20	Formula in Note 4 shall apply	7,500–12,000
Over 20 to 25		9,000–12,000
		14,000–16,000
Over 25 to 30		12,000–16,000 (single-acting hammers)
Greater than 30		15,000–20,000 (double-acting hammers)

For SI: 1 ton = 907.18 kg, 1 inch = 25.4 mm.

**Notes:**

- The driving resistance exerted by nonbearing materials is the resistance experienced by the pile during driving, but which will be dissipated with time and may be approximated as described in Section 1809.3.
- The hammer energy indicated is the rated energy.
- Sustained driving resistance. Where piles are to bear in soft rock, the minimum driving resistance shall be maintained for the last 6 inches (152.4 mm), unless a higher sustained driving resistance requirement is established by load test. Where piles are to bear in soil Classes 2 through 5, the minimum driving resistance measured in blows per inch (blows per 25 mm) shall be maintained for the last 12 inches unless load testing demonstrates a requirement for higher sustained driving resistance. No pile need be driven to a resistance that penetrates in blows per inch (blows per 25 mm) more than twice the resistance indicated in this table nor beyond the point at which there is no measurable net penetration under the hammer blow.
- The minimum driving resistance shall be determined by the following formula:

$$P = 2W_h H \quad \text{or} \quad P = 2E$$

$$(S + 0.1) \quad (S + 0.1)$$

where:

$P$  = Allowable pile load in pounds.

$W_p$  = Weight of pile in pounds.

$W_h$  = Weight of striking part of hammer in pounds.

$H$  = Actual height of fall of striking part of hammer in feet.

$E$  = Rated energy delivered by the hammer per blow in foot/lbs.

$S$  = Penetration of pile per blow, in inches, after the pile has been driven to a depth where successive blows produce approximately equal net penetration.

The value  $W_p$  shall not exceed three times  $W_h$ .

**1809.4 Installation of driven piles.** Driven piles shall be installed in accordance with Section 1808.2.6 and Sections 1809.4.1 through 1809.4.3.

**1809.4.1 Driving near fresh concrete.** Piles shall not be driven adjacent to fresh concrete that is less than 3 days old without approval by the engineer.

**1809.4.2 Heaved piles.** Piles that have heaved during the driving of adjacent piles shall be redriven as necessary to develop the required capacity and penetration, or the capacity of the pile shall be verified by load tests in accordance with Section 1808.4.

**1809.4.3 Use of vibratory drivers.** Vibratory drivers shall only be used to install piles where the pile is subsequently seated by an impact hammer to the final driving criteria established in accordance with Section 1809.3.

**1809.5 Timber piles.** Timber piles shall be designed in accordance with the AF&PA NDS.

**1809.5.1 Materials.** Round timber piles shall conform to ASTM D 25. Sawn timber piles shall conform to DOC PS-20.

**1809.5.2 Preservative treatment.** Timber piles used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of the untreated timber piles will be below the lowest groundwater level assumed to exist during the life of the structure as specified in Section 1808.2.12. Preservative and minimum final retention shall be in accordance with AWWA C3 for round timber piles and AWWA C24 for sawn timber piles. Preservative-treated timber piles shall be subject to a quality control program administered by an approved agency. Pile cuts shall be treated in accordance with AWWA M4.

**1809.5.3 Defective piles.** Any sudden decrease in driving resistance of a timber pile shall be investigated with regard to the possibility of damage. If the sudden decrease in driving resistance cannot be correlated to load-bearing data, the pile shall be removed for inspection, or rejected.

**1809.5.4 Sizes of piles.** Piles shall be of adequate size to resist the applied loads without creating stresses in the pile material in excess of 1,200 psi (8.27 MPa) for piles of southern pine, Douglas fir, oak, or other wood of comparable strength; or 800 psi (5.52 MPa) for piles of cedar, Norway pine, spruce or other wood of comparable strength. Piles of 25 tons (222.5 kN) of capacity or more shall have a minimum 8-inch tip (203 mm) with uniform taper. Piles of less than 25 tons (222.5 kN) of capacity shall have a minimum 6-inch (152 mm) tip with uniform taper. All piles, regardless of capacity, driven to end bearing on bedrock of Classes 1a to 1d and compact gravels and sands of Class 2a shall have a minimum 8-inch (203 mm) tip and a uniform taper. Any species of wood may be used that conforms to ASTM D 25 and that will stand the driving stresses.

**1809.5.5 Lagged or inverted piles.** The use of lagged or inverted piles is permitted. Double lagging shall be adequately connected to the basic pile material to transfer the full pile load from the basic pile material to the lagging without exceeding values of allowable stress as estab-

lished in Chapter 23. The connection for single lagging shall be proportioned for half the pile load. The diameter of any inverted pile at any section shall be adequate to resist the applied load without exceeding the stresses specified in Section 1809.5.4, but in no case shall it be less than 8 inches (203 mm).

#### **1809.6 Precast concrete piles.**

**1809.6.1 General.** The materials, reinforcement and installation of precast concrete piles shall conform to Sections 1809.6.1.1 through 1809.6.1.4.

**1809.6.1.1 Design and manufacture.** Piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by handling, driving and service loads.

**1809.6.1.2 Minimum dimension.** The minimum horizontal dimension shall be 8 inches (203 mm). Corners of square piles shall be chamfered.

**1809.6.1.3 Reinforcement.** Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced not more than 4 inches (102 mm) apart, center to center, for a distance of 2 feet (610 mm) from the ends of the pile; and not more than 6 inches (152 mm) elsewhere except that at the ends of each pile, the first five ties or spirals shall be spaced 1 inch (25 mm) center to center. The gage of ties and spirals shall be as follows:

1. For piles having a least horizontal dimension of 16 inches (406 mm) or less, wire shall not be smaller than 0.22 inch (5.6 mm) (No. 5 gage).
2. For piles having a least horizontal dimension of more than 16 inches (406 mm) and less than 20 inches (508 mm), wire shall not be smaller than 0.238 inch (6 mm) (No. 4 gage).
3. For piles having a least horizontal dimension of 20 inches (508 mm) and larger, wire shall not be smaller than  $\frac{1}{4}$  inch (6.4 mm) round or 0.259 inch (6.6 mm) (No. 3 gage).

**1809.6.1.4 Installation.** Piles shall be handled and driven so as not to cause injury or overstressing in a manner that affects durability or strength. A precast concrete pile shall not be driven before the concrete has attained a compressive strength of at least 75 percent of the 28-day specified compressive strength ( $f'_c$ ), and not less than the strength sufficient to withstand handling and driving forces.

**1809.6.2 Precast nonprestressed piles.** Precast nonprestressed concrete piles shall conform to Sections 1809.6.2.1 through 1809.6.2.4.

**1809.6.2.1 Materials.** Concrete shall have a 28-day specified compressive strength ( $f'_c$ ) of not less than 3,000 psi (20.68 MPa).

**1809.6.2.2 Minimum reinforcement.** The minimum amount of longitudinal reinforcement shall be 0.8 percent of the concrete section and consist of at least four bars.

**1809.6.2.2.1 Seismic reinforcement in Seismic Design Category C.** Where a structure is assigned



to Seismic Design Category C in accordance with Section 1613, longitudinal reinforcement with a minimum steel ratio of 0.01 shall be provided throughout the length of precast concrete piles. Within three pile diameters of the bottom of the pile cap, the longitudinal reinforcement shall be confined with closed ties or spirals of a minimum  $\frac{3}{8}$ -inch (9.5 mm) diameter. Ties or spirals shall be provided at a maximum spacing of eight times the diameter of the smallest longitudinal bar, not to exceed 6 inches (152 mm). Throughout the remainder of the pile, the closed ties or spirals shall have a maximum spacing of 16 times the smallest longitudinal-bar diameter, not to exceed 6 inches (152 mm).

**1809.6.2.2.2 Seismic reinforcement in Seismic Design Category D.** Where a structure is assigned to Seismic Design Category D in accordance with Section 1613, the requirements of Seismic Design Category C shall apply, except that transverse reinforcement shall comply with requirements of Section 1810.1.2.5.

**1809.6.2.3 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1809.6.2.4 Concrete cover.** For concrete cover requirements, see Table 1808.2.13.

**1809.6.3 Precast prestressed piles.** Precast prestressed concrete piles shall conform to the requirements of Sections 1809.6.3.1 through 1809.6.3.4.

**1809.6.3.1 Materials.** Prestressing steel shall conform to ASTM A 416. Concrete shall have a 28-day specified compressive strength ( $f'_c$ ) of not less than 5,000 psi (34.48 MPa).

**1809.6.3.2 Design.** Precast prestressed piles shall be designed to resist stresses induced by handling and driving as well as by loads. The effective prestress in the pile shall not be less than 400 psi (2.76 MPa) for piles less than 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles between 30 and 50 feet (9144 mm and 15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length. Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

**1809.6.3.2.1 Design in Seismic Design Category C.** Where a structure is assigned to Seismic Design Category C in accordance with Section 1613, precast prestressed piles shall have transverse reinforcement in accordance with this section. The minimum volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.

$$\rho_s = 0.12f'_c / f_{yh} \quad (\text{Equation 18-4})$$

where:

$f'_c$  = Specified compressive strength of concrete, psi (MPa).

$f_{yh}$  = Yield strength of spiral reinforcement  $\leq 85,000$  psi (586 MPa).

$\rho_s$  = Spiral reinforcement index (vol. spiral/vol. core).

At least one-half the volumetric ratio required by Equation 18-4 shall be provided below the upper 20 feet (6096 mm) of the pile.

The pile cap connection by means of dowels as indicated in Section 1808.9 is permitted. Pile cap connection by means of developing pile reinforcing strand is permitted provided that the pile reinforcing strand results in a ductile connection.

**1809.6.3.2.2 Design in Seismic Design Category D.** Where a structure is assigned to Seismic Design Category D in accordance with Section 1613.5.6, the requirements for Seismic Design Category C in Section 1809.6.3.2.1 shall be met, in addition to the following:

1. Requirements in ACI 318, Chapter 21, do not apply, unless specifically referenced.
2. Where the total pile length in the soil is 35 feet (10 668 mm) or less, the lateral transverse reinforcement in the ductile region shall occur through the length of the pile. Where the pile length exceeds 35 feet (10 668 mm), the ductile pile region shall be taken as the greater of 35 feet (10 668 mm) or the distance from the underside of the pile cap to the point of zero curvature plus three times the least pile dimension.
3. In the ductile region, the center-to-center spacing of the spirals or hoop reinforcement shall not exceed one-fifth of the least pile dimension, six times the diameter of the longitudinal strand, or 8 inches (203 mm), whichever is smaller.
4. Circular spiral reinforcement shall be spliced by lapping one full turn and bending the end of the spiral to a 90-degree hook or by use of a mechanical or welded splice complying with Section 12.14.3 of ACI 318.
5. Where the transverse reinforcement consists of circular spirals, the volumetric ratio of spiral transverse reinforcement in the ductile region shall comply with the following:

$$\rho_s = 0.25(f'_c / f_{yh})(A_g / A_{ch} - 1.0) / [0.5 + 1.4P / (f'_c A_g)] \quad (\text{Equation 18-5})$$

but not less than

$$\rho_s = 0.12(f'_c / f_{yh}) / [0.5 + 1.4P / (f'_c A_g)]^3 \quad (\text{Equation 18-6})$$

and need not exceed:

$$\rho_s = 0.021 \quad (\text{Equation 18-7})$$

where:

$A_g$  = Pile cross-sectional area, square inches (mm<sup>2</sup>).

$A_{ch}$  = Core area defined by spiral outside diameter, square inches (mm<sup>2</sup>).

$f'_c$  = Specified compressive strength of concrete, psi (MPa).

$f_{yh}$  = Yield strength of spiral reinforcement  $\leq$  85,000 psi (586 MPa).

$P$  = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

$\rho_s$  = Volumetric ratio (vol. spiral/vol. core).

6. When transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacings, and perpendicular to dimension,  $h_c$ , shall conform to:

$$A_{sh} = 0.3s h_c (f'_c / f_{yh}) (A_g / A_{ch} - 1.0) [0.5 + 1.4P / (f'_c A_g)]$$

(Equation 18-8)

but not less than:

$$A_{sh} = 0.12s h_c (f'_c / f_{yh}) [0.5 + 1.4P / (f'_c A_g)]$$

(Equation 18-9)

where:

$f_{yh}$  =  $\leq$  70,000 psi (483 MPa).

$h_c$  = Cross-sectional dimension of pile core measured center to center of hoop reinforcement, inch (mm).

$s$  = Spacing of transverse reinforcement measured along length of pile, inch (mm).

$A_{sh}$  = Cross-sectional area of transverse reinforcement, square inches (mm<sup>2</sup>).

$f'_c$  = Specified compressive strength of concrete, psi (MPa).

The hoops and cross ties shall be equivalent to deformed bars not less than No. 3 in size. Rectangular hoop ends shall terminate at a corner with seismic hooks.

Outside of the length of the pile requiring transverse confinement reinforcing, the spiral or hoop reinforcing with a volumetric ratio not less than one-half of that required for transverse confinement reinforcing shall be provided.

**1809.6.3.3 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1809.6.3.4 Concrete cover.** For concrete cover requirements, see Table 1808.2.13.

**1809.7 Structural steel piles.** Structural steel piles shall conform to the requirements of Sections 1809.7.1 through 1809.7.4.

**1809.7.1 Materials.** Structural steel piles, steel pipe and fully welded steel piles fabricated from plates shall conform to ASTM A 36, ASTM A 252, ASTM A 283, ASTM A 572, ASTM A 588, ASTM A 690, ASTM A 913 or ASTM A 992.

**1809.7.2 Allowable stresses.** For the allowable stresses for materials used in piles see Table 1808.8.

**1809.7.3 Dimensions of H-piles.** Sections of H-piles shall comply with the following:

1. The flange projections shall not exceed 14 times the minimum thickness of metal in either the flange or the web and the flange widths shall not be less than 80 percent of the depth of the section.
2. The nominal depth in the direction of the web shall not be less than 8 inches (203 mm).
3. Flanges and web shall have a minimum nominal thickness of  $3/8$  inch (9.5 mm).

**1809.7.4 Dimensions of steel pipe piles.** Steel pipe piles driven open ended shall have a nominal outside diameter of not less than 8 inches (203 mm). The pipe shall have a minimum of 0.34 square inch (219 mm<sup>2</sup>) of steel in cross section to resist each 1,000 foot-pounds (1356 N×m) of pile hammer energy or the equivalent strength for steels having a yield strength greater than 35,000 psi (241 MPa), or the wave equation analysis shall be permitted to be used to assess compression stresses induced by driving to evaluate if the pile section is appropriate for the selected hammer. Where pipe wall thickness less than 0.188 inch (4.8 mm) is driven open ended, a suitable cutting shoe shall be provided.

## SECTION BC 1810 CAST-IN-PLACE CONCRETE PILES

**1810.1 General.** The materials, reinforcement and installation of cast-in-place concrete piles shall conform to Sections 1810.1.1 through 1810.1.3.

**1810.1.1 Materials.** Concrete or grout shall have a 28-day specified compressive strength ( $f'_c$ ) of not less than 2,500 psi (17.24 MPa), except in micropiles and caisson piles where the minimum compressive strength shall be 4,000 psi (27 580 kPa). Where concrete is placed through a funnel hopper at the top of the pile, the concrete mix shall be designed and proportioned so as to produce a cohesive workable mix having a slump of not less than 4 inches (102 mm) and not more than 6 inches (152 mm). Where concrete or grout is to be pumped, the mix design shall be such that material produced is suitable for pumping.

**1810.1.2 Placement of reinforcement.** Reinforcement where required shall be placed in accordance with Section 1810.3.4 and shall be assembled, tied together, and placed in the pile as a unit before concrete or grout is placed.

**Exceptions:** Where approved by the engineer, reinforcement may be placed after the piles are filled with concrete or grout under the following situations:

1. Tied reinforcement in augered uncased cast-in-place piles, while the concrete or grout is still in a semifluid state.
2. Tied reinforcement in piles filled with grout, while the grout is in a semifluid state.
3. Steel dowels embedded 5 feet (1524 mm) or less in the pile while the concrete or grout is still in a semifluid state.

**1810.1.2.1 Design cracking moment.** The design cracking moment ( $\phi M_n$ ) for a cast-in-place deep foundation element not enclosed by a structural steel pipe or tube shall be determined using the following equation:

$$\phi M_n = 3\sqrt{f'_c} \times S_m$$

$$\text{For SI: } \phi M_n = 0.25\sqrt{f'_c} \times S_m \quad (\text{Equation 18-11})$$

where:

$f'_c$  = Specified compressive strength of concrete or grout, psi (MPa).

$S_m$  = Elastic section modulus, neglecting reinforcement and casing, cubic inches (mm<sup>3</sup>).

**1810.1.2.2 Required reinforcement.** Where subject to uplift, or where the required moment strength determined using the load combinations of Section 1605.2 exceeds the design cracking moment determined in accordance with Section 1810.1.2.1, cast-in-place concrete piles not enclosed by a structural steel pipe or tube shall be reinforced.

**1810.1.2.3 Reinforcement in Seismic Design Categories C & D.** Where a structure is assigned to Seismic Design Category C in accordance with Section 1613, reinforcement shall be provided in accordance with Section 1810.1.2.4. Where a structure is assigned to Seismic Design Category D, reinforcement shall be provided in accordance with Section 1810.1.2.5.

**1810.1.2.4 Seismic reinforcement in Seismic Design Category C.** For structures assigned to Seismic Design Category C in accordance with Section 1613, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. A minimum of four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.0025, shall be provided throughout the minimum reinforced length of the element as defined below starting at the top of the element. The minimum reinforced length of the element shall be the greatest of the following:

1. One-third of the element length;
2. A distance of 10 feet (3048 mm);
3. Three times the least element dimension; or
4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.1.2.1

exceeds the required moment strength determined using the load combinations of Section 1605.2.

Transverse reinforcement shall consist of closed ties or spirals with a minimum diameter of  $\frac{3}{8}$  inch (9.5 mm). Spacing of transverse reinforcement shall not exceed the smaller of 6 inches (152 mm) or 8-longitudinal-bar diameters, within a distance of three times the least element dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 16 longitudinal bar diameters throughout the remainder of the reinforced length.

**Exceptions:**

1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
2. A spiral-welded metal casing of a thickness not less than manufacturer's standard No. 14 gage (0.068 inch) (1.73 mm) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

**1810.1.2.5 Seismic reinforcement in Seismic Design Category D.** For structures assigned to Seismic Design Category D in accordance with Section 1613, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. A minimum of four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.005, shall be provided throughout the minimum reinforced length of the element as defined below starting at the top of the element.

The minimum reinforced length of the element shall be the greatest of the following:

1. One-half of the element length;
2. A distance of 10 feet (3048 mm);
3. Three times the least element dimension; or
4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of Section 1605.2.

Transverse reinforcement shall consist of closed ties or spirals no smaller than No. 3 bars for elements with a least dimension of up to 20 inches (508 mm), and No. 4 bars for larger elements. Throughout the remainder of the reinforced length outside the regions with transverse confinement reinforcement, as specified in Section 1810.1.2.5.1 or 1810.1.2.5.2, the spacing of transverse reinforcement shall not exceed the least of the following:

1. 12 longitudinal bar diameters;
2. One-half the least dimension of the element; or

3. 12 inches (305 mm).

**Exceptions:**

1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
2. A spiral-welded metal casing of a thickness not less than manufacturer's standard gage No. 14 gage (0.068 inch) (1.73 mm) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

**1810.1.2.5.1 Site Classes A through D.** For Site Class A, B, C and D, transverse confinement reinforcement shall be provided in the element in accordance with Sections 21.6.4.2, through 21.6.4.4 of ACI 318 within three times the least element dimension of the bottom of the pile cap. A transverse spiral reinforcement ratio of not less than one-half of that required in Section 21.6.4.4(a) of ACI 318 shall be permitted.

**1810.1.2.5.2 Site Classes E and F.** For Site Class E or F, transverse confinement reinforcement shall be provided in the element in accordance with Sections 21.6.4.2 through 21.6.4.4 of ACI 318 within seven times the least element dimension of the pile cap and within seven times the least element dimension of the interfaces of strata of Class 4b or better and strata that are liquefiable or are composed of material meeting Class 4c or 6.

**1810.1.3 Concrete or grout placement.** Concrete or grout shall be placed in such a manner as to ensure the exclusion of any foreign matter and to secure a full-sized shaft. Concrete or grout shall not be placed through water except where a tremie or other approved method is used. When depositing concrete from the top of the pile, the concrete shall not be chuted directly into the pile but shall be poured in a rapid and continuous operation through a funnel hopper centered at the top of the pile. Grout for auger cast piles shall be pumped through a hollow stem auger and shall be maintained as fluid throughout placement.

**1810.2 Enlarged base piles.** Enlarged base piles shall conform to the requirements of Sections 1810.2.1 through 1810.2.5.

**1810.2.1 Materials.** The maximum size of coarse aggregate for concrete shall be  $\frac{3}{4}$  inch (19.1 mm). Concrete to be compacted shall have a zero slump.

**1810.2.2 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1810.2.3 Installation.** Enlarged bases formed either by compacting concrete or driving a precast base shall be formed in or driven into granular soils. Piles shall be constructed in the same manner as successful prototype test piles driven for the project. Pile shafts extending through

peat or other organic soil shall be encased in a permanent steel casing. Where a cased shaft is used, the shaft shall be adequately reinforced to resist column action or the annular space around the pile shaft shall be filled sufficiently to re-establish lateral support by the soil. Where pile heave occurs, the pile shall be replaced unless it is demonstrated that the pile is undamaged and capable of carrying twice its design load.

**1810.2.4 Load-bearing capacity.** Pile load-bearing capacity shall be verified by load tests in accordance with Section 1808.4.

**1810.2.5 Concrete cover.** For minimum concrete cover requirements see Table 1802.13.

**1810.3 Drilled or augered uncased piles.** Drilled or augered uncased piles shall conform to Sections 1810.3.1 through 1810.3.5.

**1810.3.1 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1810.3.2 Dimensions.** The minimum diameter of drilled or augered uncased piles shall be 12 inches (305 mm).

**1810.3.3 Installation.** Where pile shafts are formed through unstable soils and concrete is placed in an open-drilled hole, a steel liner shall be inserted in the hole prior to placing the concrete. Where the steel liner is withdrawn during concreting, the level of concrete shall be maintained above the bottom of the liner at a sufficient height to offset any hydrostatic or lateral soil pressure.

Where grout is placed by pumping through a hollow-stem auger, the auger shall be permitted to rotate in a clockwise direction during withdrawal. An initial head of grout shall be established and maintained on the auger flights before withdrawal. The auger shall be withdrawn in a continuous manner in increments of about 12 inches (305 mm) each. Grout pumping pressures shall be measured and maintained high enough at all times to offset hydrostatic and lateral earth pressures. Grout volumes shall be measured to ensure that the volume of grout placed in each pile is equal to or greater than the theoretical volume of the hole created by the auger. Where the installation process of any pile is interrupted or a loss of grout pressure occurs, the pile shall be re-drilled to 5 feet (1524 mm) below the elevation of the tip of the auger when the installation was interrupted or grout pressure was lost and reformed. Augered cast-in-place piles shall not be installed within six pile diameters center to center of a pile filled with concrete or grout less than 12 hours old, unless approved by the engineer. The level at which return of the grout occurs during withdrawal shall be recorded. If the grout level in any completed pile drops during installation of an adjacent pile, the pile shall be replaced. The installation shall be performed under the direct supervision of the engineer. The engineer shall certify to the commissioner that the piles were installed in compliance with the approved construction documents.

**1810.3.4 Reinforcement.** For piles installed with a hollow-stem auger, where full-length longitudinal steel reinforcement is placed without lateral ties, the reinforcement



shall be placed through ducts in the auger prior to filling the pile with concrete. Concrete cover for pile reinforcement shall be in accordance with Table 1808.2.13.

**Exception:** Where physical constraints do not allow the placement of the longitudinal reinforcement prior to filling the pile with concrete or where partial-length longitudinal reinforcement is placed without lateral ties, the reinforcement is allowed to be placed after the piles are completely concreted but while concrete is still in a semifluid state.

**1810.3.5 Reinforcement in Seismic Design Category C or D.** Where a structure is assigned to Seismic Design Category C or D in accordance with Section 1613, the corresponding requirements of Sections 1810.1.2.3 through 1810.1.2.5 shall be met.

**1810.4 Driven uncased piles.** Driven uncased piles shall not be permitted.

**1810.5 Steel-cased piles.** Steel-cased piles shall comply with the requirements of Sections 1810.5.1 through 1810.5.4.

**1810.5.1 Materials.** Pile shells or casings shall be of steel and be sufficiently strong to resist collapse and sufficiently water tight to exclude any foreign materials during the placing of concrete. Steel shells shall have a sealed tip with a diameter of not less than 8 inches (203 mm).

**1810.5.2 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1810.5.2.1 Shell thickness.** The thickness of the steel shell shall not be less than manufacturer's standard No. 14 gage (0.068 inch) (1.75 mm) minimum.

**1810.5.2.2 Shell type.** The shell shall be seamless or provided with seams of strength equal to the basic material and be of a configuration that will provide confinement to the cast-in-place concrete.

**1810.5.2.3 Strength.** The ratio of steel yield strength ( $f_y$ ) to 28-day specified compressive strength ( $f'_c$ ) shall not be less than six.

**1810.5.2.4 Diameter.** The nominal pile diameter shall not be greater than 16 inches (406 mm).

**1810.5.3 Installation.** Steel shells shall be mandrel driven for their full length in contact with the surrounding soil. The steel shells shall be driven in such order and with such pacing as to ensure against distortion of or injury to piles already in place. A pile shall not be driven within four and one-half average pile diameters of a pile filled with concrete less than 24 hours old unless approved by the commissioner. Concrete shall not be placed in steel shells within heave range of driving.

**1810.5.4 Reinforcement.** Reinforcing shall be required for unsupported pile lengths or where the pile is designed to resist uplift or unbalanced lateral loads. For minimum concrete cover requirements, see Table 1808.2.13.

**1810.5.4.1 Seismic reinforcement.** Where a structure is assigned to Seismic Design Category C or D in

accordance with Section 1613, the reinforcement requirements of Sections 1810.1.2.3 through 1810.2.5 shall be met.

**1810.6 Concrete-filled steel pipe and tube piles.** Concrete-filled steel pipe and tube piles shall conform to the requirements of Sections 1810.6.1 through 1810.6.5.

**1810.6.1 Materials.** Steel pipe and tube sections used for piles shall conform to ASTM A 252 or ASTM A 283. Concrete shall conform to Section 1810.1.1. The maximum coarse aggregate size shall be  $\frac{3}{4}$  inch (19.1 mm).

**1810.6.2 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1810.6.3 Minimum dimensions.** Piles shall have a nominal outside diameter of not less than 8 inches (203 mm) and a minimum wall thickness in accordance with Section 1809.3.4. For mandrel-driven pipe piles, the minimum wall thickness shall be  $\frac{1}{10}$  inch (2.5 mm).

**1810.6.4 Reinforcement.** Reinforcement steel shall conform to Section 1810.1.2. For minimum concrete cover requirements see Table 1808.2.13.

**1810.6.4.1 Seismic reinforcement.** Where a structure is assigned to Seismic Design Category C or D in accordance with Section 1613, minimum reinforcement no less than 0.01 times the cross-sectional area of the pile concrete shall be provided in the top of the pile with an embedment length equal to two times the required cap embedment anchorage into the pile cap, but not less than the tension development length of the reinforcement. The wall thickness of the steel pipe shall not be less than  $\frac{3}{16}$  inch (5 mm).

**1810.6.5 Placing concrete.** The placement of concrete shall conform to Section 1810.1.3.

**1810.7 Caisson piles.** Caisson piles shall conform to the requirements of Sections 1810.7.1 through 1810.7.7.

**1810.7.1 Construction.** Caisson piles shall consist of a shaft section of concrete or grout-filled pipe, extending to bedrock, with an uncased socket drilled into bedrock of Class 1c or better and filled with concrete or grout. The caisson pile shall have a full-length structural steel core, full length steel reinforcing, or a stub core or steel reinforcing installed in the rock socket and extending into the pipe portion a distance equal to the socket depth. The minimum outside diameter of the caisson pile shall be 7 inches (194 mm), and the diameter of the rock socket shall be approximately equal to the inside diameter of the pile.

**1810.7.2 Materials.** Pipe and steel cores shall conform to the material requirements in Section 1809.3. Pipes shall have a minimum wall thickness of  $\frac{3}{8}$  inch (9.5 mm) and shall be fitted with a suitable steel-driving shoe or cutting teeth welded to the bottom of the pipe. Concrete or grout shall have a 28-day specified compressive strength ( $f'_c$ ) of not less than 4,000 psi (27.58 MPa).

**1810.7.2.1 Reinforcing bars.** For the purposes of Section 1810.7, threaded bars conforming to ASTM A 615 and ASTM A 722 shall be considered the same as deformed reinforcing bars.

**1810.7.3 Rock socket design.** The depth of the rock socket in Class 1c rock or better shall be sufficient to develop the full load-bearing capacity of the caisson pile based upon the sum of the allowable bearing pressure on the bottom of the socket in accordance with Table 1804.1 plus an allowable bond stress of 200 psi on the sides of the socket. The depth of the socket in Class 1c rock or better below the bottom of the pipe shall not be less than 3 feet (914 mm) of the outside diameter of the pipe.

**1810.7.3.1 Increased allowable bond stress.** Load tests, with instrumentation in the rock socket to demonstrate the transfer of force to the rock, shall be performed to justify the use of bond stresses above 200 psi (1379 kPa). The number of load tests shall be in accordance with the requirements of Section 1808.4.1.1. A report summarizing the methods and results of the load test shall be submitted to the commissioner for approval.

**1810.7.4 Structural core and steel reinforcing.** The gross cross-sectional area of the structural steel core or bundled center reinforcing shall not exceed 30 percent of the gross area of the caisson. For reinforcing placed at the perimeter of the caisson, the area of the reinforcing shall not exceed 8 percent of the area inside the casing. Minimum concrete cover shall be in accordance with Table 1808.2.13.

**1810.7.4.1 Splicing of steel reinforcing.** Steel reinforcing shall be spliced in accordance with the requirements of ACI 318.

**1810.7.4.2 Seismic reinforcement.** Where a structure is assigned to Seismic Design Category C or D in accordance with Section 1613, the reinforcement requirements of Section 1810.6.4.1 shall be met.

**1810.7.5 Allowable stresses.** For allowable stresses, see Table 1808.8.

**1810.7.6 Installation.** The rock socket and pile shall be thoroughly cleaned of foreign materials before filling with concrete or grout. Steel cores shall be set within 6 inches (125 mm) above the base of the rock socket. Concrete shall not be placed through water except where a tremie or other method approved by the commissioner is used.

**1810.7.7 Rock socket inspection.** Caisson rock sockets shall be subject to special inspection in accordance with Section 1704.9. All caisson rock sockets shall be inspected to verify rock quality. Inspection may be accomplished by direct observation, by video methods or by a core boring performed prior to the drilling of the socket.

**1810.8 Micropiles.** Micropiles shall conform to Sections 1810.8.1 through 1810.8.6.

**1810.8.1 Materials.** Reinforcement shall consist of deformed reinforcing bars in accordance with ASTM A 615 Grade 60 or 75 or ASTM A 722 Grade 150. The steel pipe or casing shall have a minimum yield strength of 45,000 psi (310 MPa) and a minimum elongation of 15

percent as shown by mill certifications or two coupon test samples per 40,000 pounds (18 160 kg) of pipe or casing.

**1810.8.2 Dimensions.** Micropiles shall have an outside diameter of between 5 and 14 inches (127 and 356 mm). The minimum diameter set forth elsewhere in Section 1810.3.5 shall not apply to micropiles. The steel pipe shall have a minimum wall thickness of  $\frac{3}{16}$  inch (4.8 mm).

**1810.8.3 Design.** Micropiles shall develop their load-carrying capacity by means of a bond zone in soil. The design of micropiles shall not consider end bearing. Micropiles shall be grouted and have either a steel pipe or steel reinforcement at every section along the length. It shall be permitted to transition compression loads from the steel pipe to the deformed reinforcing bars by extending the bars into the pipe section by at least their development length in tension, in accordance with ACI 318.

**1810.8.3.1 Reinforcement.** For micropiles or portions thereof grouted inside a temporary or permanent casing or a hole drilled with grout, the steel pipe or steel reinforcement shall be designed to carry at least 40 percent of the design compression load. Micropiles or portions thereof grouted in an open hole in soil without temporary or permanent casing and without suitable means of verifying the hole diameter during grouting shall be designed to carry the entire compression load in the reinforcing steel. Where a steel pipe is used for reinforcement, the portion of the grout enclosed within the pipe is permitted to be included in the determination of the allowable stress in the grout.

**1810.8.3.2 Seismic reinforcement.** For structures assigned to Seismic Design Category C, a permanent steel casing shall be provided from the top of the micropile down to the point of zero curvature. For structures assigned to Seismic Design Category D, the micropile shall be approved by the commissioner in accordance with Section 28-113.2 of the *New York City Administrative Code*. The alternative system design, supporting documentation and test data shall be submitted to the commissioner for review and approval.

**1810.8.4 Splices.** Splices in reinforcing bars shall be made in accordance with ACI 318. Splices in the steel pipe or casing shall be made by use of flush threaded joints, or by welded joints. Reductions for the structural capacity of the threaded joint casing at splice locations shall be accounted for in the design.

**1810.8.5 Installation.** Micropile deep foundation elements shall be permitted to be formed in holes advanced by rotary or percussive drilling methods, with or without casing. The elements shall be grouted with a fluid cement grout. The grout shall be pumped through a tremie pipe extending to the bottom of the element until grout of suitable quality returns at the top of the element. The following requirements apply to specific installation methods:

1. For micropiles grouted inside a temporary casing, the reinforcing bars shall be inserted prior to withdrawal of the casing. The casing shall be withdrawn in a controlled manner with the grout level maintained at the top of the element to ensure that the grout completely fills the drill hole.

2. For a micropile or portion thereof grouted in an open drill hole in soil without a temporary casing, the minimum design diameter of the drill hole shall be verified by a suitable device prior to grouting.
3. Subsequent micropiles shall not be drilled near elements that have been grouted until the grout has had sufficient time to harden.
4. Micropiles shall be grouted as soon as possible after drilling is completed.
5. For micropiles designed with a full-length casing, the casing shall be pulled back to the top of the bond zone and reinserted or some other suitable means employed to assure grout coverage outside the casing.

**1810.8.5.1 Drilling with air.** Where existing structures may be affected by subsurface disturbances, air drilling shall be prohibited.

**1810.8.6 Pressure grouted bond zone.** Micropiles shall be installed with a pressure grouted bond zone. The bond zone shall be formed entirely in soil of Class 4 or better and the grout shall be placed under pressure exceeding 1.5 times the existing total overburden pressure. The bond zone shall be formed by extending the casing to the bottom of the bond zone and withdrawing the casing while the grout is being pumped under pressure. The casing above the bond zone shall remain in place permanently. Reinforcing to the bond zone shall be placed in the casing to the depth of the bond zone prior to placing grout.

## SECTION BC 1811 COMPOSITE PILES

**1811.1 General.** Composite piles shall conform to the requirements of Sections 1811.2 through 1811.5.

**1811.2 Design.** Composite piles consisting of two or more approved pile types shall be designed to meet the conditions of installation.

**1811.3 Limitation of load.** The maximum allowable load shall be limited by the capacity of the weakest section incorporated in the pile.

**1811.4 Splices.** Splices between concrete and steel or wood sections shall be designed to prevent separation both before and after the concrete portion has set, and to ensure the alignment and transmission of the total pile load. Splices shall be designed to resist uplift caused by upheaval during driving of adjacent piles, and shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section.

**1811.5 Seismic reinforcement.** Where a structure is assigned to Seismic Design Category C or D, in accordance with Section 1613 and where concrete and steel are used as part of the pile assembly, the concrete reinforcement shall comply with Sections 1810.1.2.3 and 1810.1.2.5 and the steel section shall comply with Section 1809.7.4 or 1810.6.4.1.

## SECTION BC 1812 HELICAL PILES

**1812.1 General.** Helical piles may be used to support axial compression, or resist axial tension and lateral loads. All helical pile foundation systems shall be approved by the commissioner in accordance with Section 28-113.2 of the *Administrative Code*.

**1812.2 Design.** Design of helical pile foundations shall be based on a geotechnical investigation in accordance with Sections 1802 and 1808.2 with the following additional conditions stated in Sections 1812.2.1 and 1812.2.2.

**Exception:** For the repair of residential porches, stoops and slab on grades, helical test probes may be used to substitute for test borings, provided the pile has a torque to capacity ratio approved in accordance with Section 28-113.2.1 of the *Administrative Code*.

**1812.2.1 Corrosion testing requirements.** Tests shall be performed in each soil layer for soil resistivity, soil pH, organic content and sulphate concentration. The device or system shall not be used in conditions that are indicative of a potential pile corrosion situation, as defined by soil resistivity less than 1,000 ohm-cm, pH less than 5.5, soils with high organic content, sulfate concentrations greater than 1,000 ppm, landfills, or mine waste.

**1812.2.2 Protective treatment.** In addition to the protective treatment requirements of Section 1808.2.12, helical pile design shall consider the abrasive action inherent in the installation process when protective exterior treatment is specified as pile protection.

**1812.3 Determination of allowable loads.** The allowable load of helical piles shall be in accordance with the applicable provisions of Section 1808.3. In addition, the requirements of this section shall apply.

**1812.3.1 Allowable axial tension and compression.** The allowable axial tension and compression load shall not exceed 30 tons (267 kN).

**1812.3.2 Allowable lateral load.** The allowable lateral load resisted by a helical pile shall not exceed 3 tons (29.4 kN).

**1812.4 Load tests.** Load tests shall be in accordance with Sections 1808.4 and 1812.4.1 through 1812.4.4.

**1812.4.1 Compression load test procedures.** The allowable axial compression load of a helical pile shall be verified by load tests in accordance with the requirements of Section 1808.4, except that ASTM D 1143 may be conducted using the Quick Load Test Loading Procedure. Following each compression load test, the test pile shall be removed by unscrewing and inspected for any deformations to the helices, to verify the structural integrity of the shaft and its connections.

**1812.4.1.1 Required number of axial compression load tests.** The number of axial compression load tests shall satisfy Section 1808.4.

**Exception:** Pile load tests shall not be required, provided the following conditions are satisfied:



1. The pile has a torque to capacity ratio approved in accordance with Section 28-113.2.1 of the *Administrative Code*;
2. The torque correlation shall demonstrate a factor of safety (FS) of 2.5 on the allowable load; and
3. The maximum allowable axial compression load on the helical pile shall be 10 tons (98 kN).

**1812.4.1.2 Acceptance criteria.** The allowable pile load shall be computed in accordance with Section 1808.4.1.5.

**1812.4.2 Axial tension load test procedures.** The allowable axial tension load of a helical pile shall be verified by load testing in accordance with Section 1808.4; however, it shall be permitted to use the Quick Load Test Loading Procedure of ASTM D 3689. Following the tension load test, the pile shall be removed by unscrewing, and shall be inspected for any deformations to the helices and to verify the structural integrity of the shaft and connections.

**1812.4.2.1 Required number of axial tension load tests.** The number of axial tension load tests shall satisfy Section 1808.4, but with a minimum of one test.

**1812.4.3 Lateral load test procedures.** The allowable lateral load of a helical pile shall be verified with load testing in accordance with Section 1808.4. Following the lateral load test, the pile shall be removed by unscrewing and inspected for any deformations to the helices, to verify the structural integrity of the shaft and connections.

**1812.4.3.1 Required number of lateral load tests.** The number of lateral load tests shall satisfy Section 1808.4, but shall not be fewer than one test.

**1812.4.3.2 Acceptance criteria.** The allowable lateral pile load shall be computed in accordance with Sections 1808.4.3.1 and 1808.4.3.2.

**1812.4.4 Additional load tests.** Additional axial compression, axial tension and lateral load tests shall be performed for questionable construction as required by Section 1808.4.1.1.1.

**1812.5 Minimum installation torque.** Where load tests are required, the test pile shall be used to determine the minimum required site-specific torque for installation of production piles. For each helical pile, the special inspector shall measure and log the installation torque for each foot of depth and the final torque in the helice's soil-bearing zone. The shaft advancement shall equal or exceed 85 percent of helix pitch per revolution at time of final torque measurement. Where load tests are not required, installation torque shall be in accordance with the exception defined under Section 1812.4.3.

**1812.6 Pile internal stability to resist overturning and translation.** Where bracket assemblies or structural eccentric forces cause bending, the resulting moment pile design shall ensure stability in accordance with Section 1808.2.5 and general engineering practice. Where side-mount brackets are used and a stability analysis indicates that there is insufficient internal stability to resist overturning and translation, helical

piles shall be installed staggered or other means shall be designed to provide stability and prevent rotation of the foundation.

**1812.7 Buckling.** When helical piles are embedded in soils of Classes 6 and 7, a buckling analysis shall be performed by a recognized method. The allowable axial compressive load shall be not more than two-thirds of the calculated load-causing buckling. The additional bending moments due to bracket assemblies, structural eccentric forces and coupling rigidity shall be appropriately included in the buckling analysis.

**1812.8 Shaft flexural capacity.** Where a moment is transmitted to a single helical pile, a structural analysis shall be conducted to verify that the shaft is capable of resisting the moment with acceptable deflection.

**1812.9 Side-mount bracket assembly test.** Where side-mount brackets are used, each bracket assembly shall be proof-tested to a minimum 110 percent of allowable load to demonstrate that the bracket assembly is capable of transferring the loads to the pile. The load shall be applied in six equal increments. The 110 percent test load shall be held for a minimum 30 minutes without bracket assembly distortion or deformation. Side-mount brackets for permanent applications shall be encased in concrete with a minimum embedment of 3 inches (76.2 mm). Concrete used to encase side-mount brackets shall meet the requirements of Sections 1903, 1904, 1905 and 1906.

**1812.10 Minimum spacing of piles.** Minimum spacing between the center lines of helical piles shall be four times the largest helix plate diameter.

**1812.11 Installation.** Equipment used for the installation of helical piles shall be as recommended by the helical pile manufacturer.

**1812.12 Special inspection.** The installation of helical piles shall be subject to the special inspection requirements in Section 1704.8 and the following requirements:

1. The special inspector shall prepare a report of special inspections of helical piles, and submit such report to the department in a manner acceptable to the commissioner. In addition to the requirements of Section 1704.8, this report shall also include, at a minimum, the following:
  - 1.1. Helical pile type and product specification sheet for the each helical pile installed as published by the manufacturer.
  - 1.2. Make and model of the equipment used for installation.
  - 1.3. Make and model number of the torque indicator used to measure installation torque.
  - 1.4. Calibration records for the torque indicators used to install the helical piles.
  - 1.5. The installation speed (rpm) of the helical pile.
  - 1.6. From axial load tests and the site specific torque to capacity relationship, the minimum torque required to achieve the allowable pile load in tension or compression.



- 1.7. For each helical pile, the installation torque for each foot of depth and the final torque in the helix's soil-bearing zone. The shaft advancement shall equal or exceed 85 percent of helix pitch per revolution at time of final torque measurement.
2. Field welds performed in the installation of a helical pile foundation system shall additionally be subject to the special inspection requirements of Section 1704.3.

### SECTION BC 1813 LIQUEFACTION ANALYSIS

**1813.1 General.** An assessment of the liquefaction potential shall be determined for each building site except Structural Occupancy/Risk Category I structures. The evaluation of liquefaction potential shall include the following considerations:

1. Noncohesive granular soils below groundwater table and less than 50 feet (15 240 mm) below the ground surface shall be considered to have potential for liquefaction.
2. The potential for liquefaction on level ground shall be determined on the basis of the risk categories associated with the standard penetration resistance normalized to an energy of 60 percent efficiency ( $N_{60}$ ) at the site, as defined in Figure 1813.1, or a site-specific analysis performed by a geotechnical engineer.

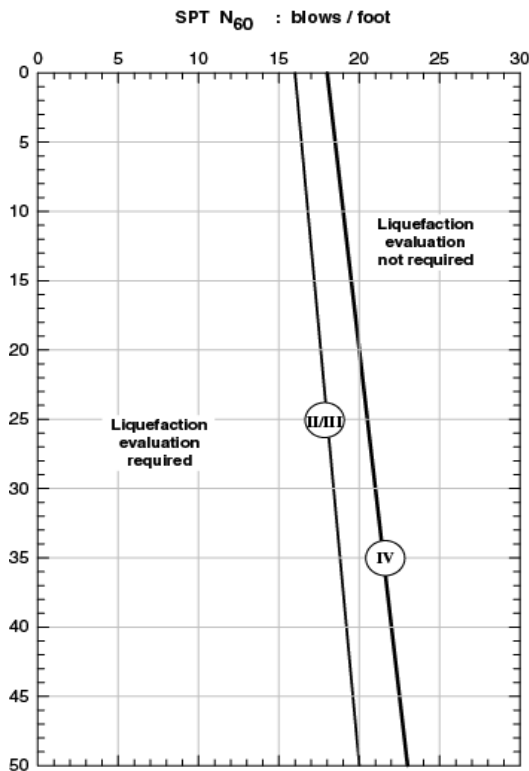


FIGURE 1813.1  
LIQUEFACTION ASSESSMENT DIAGRAM

3. Clays, silts and clayey silts below the groundwater table and less than 50 feet (15 240 mm) below the ground surface with a plasticity index less than 20 shall be considered to have potential for liquefaction. The susceptibility of the fine grained soils shall be evaluated in accordance with generally accepted engineering practice or a site-specific analysis performed by a geotechnical engineer.

**1813.2 Site-specific analyses.** In evaluating liquefaction potential, the analysis shall consider the following parameters: peak ground acceleration, earthquake magnitude, magnitude scaling factor, effective overburden pressure, hammer energy, cone penetration resistance (where applicable), and fines content. If a site response analysis is conducted, bed-rock acceleration time histories and a shear wave velocity profile based on in-situ measurements may be utilized. These analyses may consider the results of laboratory cyclic shear tests. Where borings are drilled for the purpose of site-specific analyses and for the purpose of evaluating liquefaction potential, the drilling and sampling procedures and apparatus shall be in accordance with ASTM D 6066.

**1813.2.1 Peak ground acceleration.** Peak ground acceleration shall be determined based on either (1) a site-specific study taking into account soil amplification effects as specified in Section 11.4.7 of ASCE 7-10 or (2) the Maximum Considered Geometric Mean peak ground acceleration adjusted for Site Class effects  $PGA_M$  as provided in Table 1813.2.1 without adjustment for targeted risk.

#### Limit Lines

- Structural Risk/Occupancy Category II/III
- - - Structural Risk/ Occupancy Category IV

#### Notes:

- 1) Diagram is applicable only to soils below the groundwater table.
- 2)  $N_{60}$  is the standard penetration resistance normalized to an energy of 60 percent efficiency.
- 3) See Table 1604.5 for Structural Risk/Occupancy Category definitions.
- 4) Structural Risk/Occupancy Category I structures are exempt from liquefaction assessment.

**TABLE 1813.2.1**  
**VALUES OF MAXIMUM CONSIDERED EARTHQUAKE**  
**GEOMETRIC MEAN (MCE<sub>g</sub>) PEAK GROUND ACCELERATIONS**  
**ADJUSTED FOR SITE CLASS EFFECTS,  $PGA_M$**

SITE CLASS	$PGA_{M(g)}$
A	0.14
B	0.17
C	0.20
D	0.24
E	0.33

**1813.3 Foundation design analysis.** The foundation design analysis shall consider an assessment of the potential consequences of any liquefaction and soil strength loss, including an estimation of total and differential settlement, lateral movement or reduction in foundation soil-bearing capacity, and may incorporate the potential benefits of any proposed mitigation measures. Such measures may be given consideration in the design of the structure and may include, but are not limited to, ground improvement, pore pressure dissipation, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements, or any combination of these measures.

In evaluating the potential for liquefaction, the effect of settlements induced by seismic motions and loss of soil strength shall be considered. The analysis performed shall incorporate the effects of the maximum considered earthquake (MCE) peak ground acceleration, appropriate earthquake magnitudes and duration consistent with the design earthquake ground motions as well as uncertainty and variability of soil properties across the site. The MCE peak ground acceleration, seismically induced cyclic stress ratios and pore pressure development may be determined from a site-specific study taking into account soil amplification effects and design ground motions appropriate for the seismic hazard. Other recognized methods of analysis may be used in the evaluation process subject to the approval of the commissioner. Effects of liquefaction shall be considered in the design except when the following conditions exist:

1. Structures classified as Risk Category I.
2. When the calculated cyclic resistance ratio (CRR) is greater than or equal to the calculated cyclic stress ratio (CSR) for Risk Category II and III structures.
3. When the calculated CRR is greater than 1.2 times the calculated CSR for Risk Category IV structures.

**1813.4 Design considerations.** Where liquefaction is determined to be probable, the following considerations shall be addressed in the design:

1. Liquefiable soils shall be considered to have no passive (lateral) resistance or bearing capacity value for the design earthquake, unless shown otherwise by accepted methods of analysis. The engineer shall submit an anal-

ysis for review and approval by the commissioner, demonstrating that the proposed construction is safe against the effects of soil liquefaction.

2. Where liquefiable soils are present in sloped ground or over sloped nonliquefiable substrata and where lateral displacement is possible, the engineer shall submit a stability analysis for review and approval by the commissioner, demonstrating that the proposed construction is safe against failure of the soil and that the effects of potential lateral displacements are acceptable.

## **SECTION BC 1814**

### **UNDERPINNING AND SUPPORT OF ADJACENT PROPERTY**

**1814.1 General.** Where the protection and/or support of a structure or property adjacent to an excavation is required, an engineer shall prepare a preconstruction report summarizing the condition of the structure or property. The preconstruction report shall be prepared based on an examination of the structure or property, the review of available documents and, if necessary, the excavation of test pits. The engineer shall determine the requirements for underpinning or other protection and prepare site and structure-specific plans, including details and sequence of work for submission to the commissioner. Such protection may be provided by underpinning, sheeting, and bracing, or by other means acceptable to the commissioner.

**1814.1.1 Underpinning and bracing.** Underpinning piers, walls, piles and footings shall be designed as permanent structural elements and installed in accordance with provisions of this chapter and Chapter 33 and shall be inspected in accordance with the provisions of Chapter 17. Underpinning shall be designed and installed in such manner so as to limit the lateral and vertical displacement of the adjacent structure to permissible values as established in accordance with Section 1814.3. The sequence of installation and the requirements for sheeting, preloading, wedging with steel wedges, jacking or dry packing shall be identified in the design. The design shall take in account the effects on foundation and structure produced by the lateral earth pressure exerted on the underpinning. Lateral support for underpinning, if needed, shall be accounted for during the design of the new construction. The design and construction sequence of temporary lateral supports used prior to the installation of the foundation walls shall be included on the design drawings.

**1814.2 Use of rock support.** Existing structures founded at a level above the level of adjacent new construction may be supported on Class 1a and 1b rock in lieu of underpinning, sheeting and bracing or retaining walls, provided that a report by the engineer substantiates the safety of the proposed construction. The engineer shall also certify that he or she has inspected the exposed rock and the jointing therein and has determined whether supplemental support of the rock face is required.

**1814.3 Monitoring.** When excavation, foundation construction, or underpinning is required, adjacent structures and properties shall be monitored in accordance with a plan prepared by the engineer. The engineer shall develop the scope of the monitoring program, including location and type of instruments, frequency and duration of readings, and permissible movement and vibration criteria. This scope shall take into account the structures or property to be monitored and the conditions thereof. The monitoring program shall include necessary actions to address exceedances. These actions shall include notification of the commissioner. Monitoring of historic and landmarked structures shall be subject to special requirements as determined by the department.

## CHAPTER 19

# CONCRETE



### SECTION BC 1901 GENERAL

**1901.1 Scope.** The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

**1901.2 Plain and reinforced concrete.** Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1908 of this code. Except for the provisions of Sections 1904 and 1910, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil.

**1901.3 Source and applicability.** Sections 1902 through 1907 of this chapter are derived from the provisions for structural concrete in ACI 318. Where sections within Chapters 2 through 7 of ACI 318 are referenced in other chapters and appendices of ACI 318, the provisions of Sections 1902 through 1907 of this code shall apply.

**1901.4 Construction documents.** The construction documents for structural concrete construction shall include:

1. Specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. Specified strength or grade of reinforcement.
3. Size and location of structural elements, reinforcement, and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.
5. Magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for posttensioning tendons.
11. For structures assigned to Seismic Design Category D, a statement if slab on grade is designed as a structural diaphragm (see Section 2112.3.4 of ACI 318).
12. Exposure classes in accordance with Section 1904.2 of this chapter and Section 4.2 of ACI 318.
13. Areas of mass-concrete where a thermal control plan is required.

**1901.5 Special inspection.** The special inspection of concrete elements of buildings and structures and concreting operations shall be in accordance with Chapter 17.

### SECTION BC 1902 DEFINITIONS

**1902.1 General.** The words and terms defined in this section and ACI 318 shall, for the purposes of this chapter and as used elsewhere in this code for concrete construction, have the meanings shown herein and in ACI 318, as modified by Section 1908.1.1 of this chapter.

**MASS CONCRETE.** Any volume of concrete with dimensions large enough to require that measures be taken to cope with generation of heat from hydration of the cement and attendant volume change to minimize cracking, reduction of compressive strength, and/or delayed ettringite formation.

### SECTION BC 1903 SPECIFICATIONS FOR TESTS AND MATERIALS

**1903.1 General.** Materials used to produce concrete and testing thereof shall comply with the applicable standards listed in ACI 318 and this section. Where required, special inspections and tests shall be in accordance with Chapter 17.

**1903.2 Cementitious materials.** Cementitious materials used to produce concrete shall comply with ACI 318, Section 3.2.

**1903.3 Aggregates.** Aggregates used in concrete shall comply with ACI 318, Section 3.3.

**1903.4 Water.** Water used in mixing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials or other substances that are deleterious to concrete or steel reinforcement and shall comply with ACI 318, Section 3.4.

**1903.5 Steel reinforcement.** Reinforcement and welding of reinforcement to be placed in concrete construction shall conform to the requirements of ACI 318, Section 3.5, and this section.

**1903.5.1 Reinforcement type.** Steel reinforcement used in concrete construction shall comply with ACI 318, Section 3.5.

**1903.5.2 Welding.** Welding of reinforcing bars shall conform to AWS D1.4 and ACI 318, Section 3.5.2. Type and location of welded splices and other required welding of reinforcing bars shall be indicated on the construction documents or in the project specifications. The ASTM reinforcing bar specifications, except for ASTM A 706, shall be supplemented to require a report of material properties necessary to conform to the requirements in AWS D1.4. A written welding procedure shall be provided to the registered design professional of record for

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approval prior to any welding. All welding shall be subject to special inspection by a special inspection agency.

**1903.6 Admixtures.** Admixtures to be used in concrete shall be subject to prior approval by the registered design professional of record and shall comply with ACI 318, Section 3.6. Admixtures shall be included in the concrete design mix submittals.

**1903.7 Storage of materials.** The storage of materials for use in concrete shall comply with ACI 318, Section 3.7, and the provisions of Sections 1903.7.1 and 1903.7.2 of this chapter.

**1903.7.1 Manner of storage.** Cementitious materials and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter.

**1903.7.2 Unacceptable material.** Any material that has deteriorated or has been contaminated shall not be used for concrete.

**1903.8 Glass fiber reinforced concrete.** Glass fiber reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI MNL 128 standard.

**1903.9 Flat wall insulating concrete form (ICF) systems.** Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E 2634.

## SECTION BC 1904 DURABILITY REQUIREMENTS

**1904.1. General.** Concrete shall be designed and proportioned to comply with the durability, strength, exposure, and other requirements as specified in Section 4.1 of ACI 318 and Sections 1904.2 through 1904.5 of this chapter.

**1904.2 Exposure categories and classes.** Concrete shall be assigned to exposure classes in accordance with ACI 318, Section 4.2, based on:

1. Exposure to freezing and thawing in a moist condition or exposure to deicing chemicals;
2. Exposure to sulfates in water or soil;
3. Exposure to water where the concrete is intended to have low permeability; and
4. Exposure to chlorides from deicing chemicals, salt, saltwater, brackish water, seawater or spray from these sources, where the concrete has steel reinforcement.

**TABLE 1904.4.2  
REQUIREMENTS FOR CONCRETE EXPOSED  
TO DEICING CHEMICALS**

CEMENTITIOUS MATERIALS	MAXIMUM PERCENT OF TOTAL CEMENTITIOUS MATERIALS BY WEIGHT <sup>a, b</sup>
Fly ash or other pozzolans conforming to ASTM C 618	25 <sup>d</sup>
Slag conforming to ASTM C 989	50
Silica fume conforming to ASTM C 1240	10
Total of fly ash or other pozzolans, slag and silica fume	50 <sup>c</sup>
Total of fly ash or other pozzolans and silica fume	35 <sup>c</sup>

a. The total cementitious material also includes ASTM C 150, ASTM C 595, ASTM C 845 and ASTM C 1157 cement.

b. The maximum percentages shall include:

1. Fly ash or other pozzolans present in Type IP or I (PM) blended cement, ASTM C 595, or ASTM C 1157.
2. Slag used in the manufacture of an IS or I (SM) blended cement, ASTM C 595, or ASTM C 1157.
3. Silica fume, ASTM C 1240, present in a blended cement.

c. Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials. The amount of fly ash or other pozzolans conforming to ASTM C 618 shall be permitted to be increased in accordance with footnote d, provided the maximum percentage of supplemental cementitious materials does not exceed the maximum values stated in Table 1904.4.2 when combining multiple types of supplemental cementitious materials.

d. Amount of fly ash or other pozzolans conforming to ASTM C 618 in a given concrete mixture can be increased to 35% provided that the concrete is not placed during cold weather as defined by ACI 306 or that the concrete is membrane cured and protected from freezing until the concrete has attained 3,500 psi.

**1904.3 Concrete properties.** Concrete mixtures shall conform to the most restrictive maximum water-cementitious materials ratios and minimum specified concrete compressive strength requirements of ACI 318, Section 4.3, based on the exposure classes assigned in Section 1904.2 of this chapter.

**Exception:** For occupancies and appurtenances thereto in Group R occupancies that are in buildings less than four stories above grade plane, normal-weight aggregate concrete is permitted to comply with the requirements of Table 1904.3 of this chapter in lieu of the requirements of ACI 318, Table 4.3.1.

**1904.4 Freezing and thawing exposures.** Concrete that will be exposed to freezing and thawing, in the presence of moisture, with or without deicing chemicals being present, shall comply with Sections 1904.4.1 and 1904.4.2.

**TABLE 1904.3  
MINIMUM SPECIFIED COMPRESSIVE STRENGTH ( $f'_c$ )**

TYPE OR LOCATION OF CONCRETE CONSTRUCTION	MINIMUM SPECIFIED COMPRESSIVE STRENGTH ( $f'_c$ at 28 days, psi)
Basement walls, foundation walls, exterior walls and other vertical concrete surfaces, basement slabs, interior slabs on grade except for garage floor slabs, and foundations not exposed to the weather	3,000 <sup>a</sup>
Driveways, curbs, walks, patios, porches, carport slabs, steps and other flatwork exposed to the weather, and garage floor slabs	3,500 <sup>b</sup>
Structural concrete exposed to weather	4,500

For SI: 1 pound per square inch = 0.00689 MPa.

a. Concrete in these locations that can be subjected to freezing and thawing during construction shall be of air-entrained concrete in accordance with Section 1904.2.

b. Concrete shall be air entrained in accordance with Section 1904.4.1.

**1904.4.1 Air entrainment.** Concrete exposed to freezing and thawing while moist shall be air entrained in accordance with ACI 318, Section 4.4.1.

**1904.4.2 Deicing chemicals.** For concrete exposed to freezing and thawing in the presence of moisture and deicing chemicals, the maximum weight of fly ash, other pozzolans, silica fume or slag that is included in the concrete shall not exceed the percentages of the total weight of cementitious materials permitted by Table 1904.4.2.

**1904.5 Alternative cementitious materials for sulfate exposure.** Combinations of cementitious materials for use in sulfate-resistant concrete that are alternative to those listed in ACI 318, Table 4.3.1 shall be permitted in accordance with ACI 318, Section 4.5.1.

## SECTION BC 1905 CONCRETE QUALITY, MIXING AND PLACING

**1905.1 General.** The required strength and durability of concrete shall be governed by compliance with the proportioning, testing, mixing and placing provisions of Sections 1905.1.1 through 1905.13.

**1905.1.1 Strength.** Concrete shall be proportioned to provide an average compressive strength in accordance with Section 1905.3, and shall satisfy the durability criteria of Section 1904. Concrete shall be produced to minimize the frequency of strengths below  $f'_c$  in compliance with Section 1905.6.3.3. For concrete designed and constructed in accordance with this chapter,  $f'_c$  shall not be less than 2,500 psi (17.22 MPa). No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318.

**1905.1.2 Cylinder tests.** Requirements for  $f'_c$  shall be based on tests of cylinders made and tested in accordance with Section 1905.6.3.

**1905.1.3 Basis of  $f'_c$ .** Unless otherwise specified,  $f'_c$  shall be based on 28-day tests. If other than 28 days, test age for  $f'_c$  shall be as indicated in construction documents. If at any time during the concrete operations, the concrete is not in conformance with ASTM C 94 or is otherwise compromised, it shall be rejected. If it is placed, the location of the load shall be recorded and a pair of cylinders shall be molded from the load per ASTM C 31 and included in the average  $f'_c$ .

**1905.1.4 Lightweight aggregate concrete.** Where design criteria in ACI 318, Sections 8.6.1, 9.5.2.3, 11.2, 12.2.4, and 22.2.4, provide for use of a splitting tensile strength value of concrete ( $f'_{ct}$ ), laboratory tests shall be made in accordance with ASTM C 330 to establish the value of  $f'_{ct}$  corresponding to the specified value of  $f'_c$ .

**1905.1.5 Field acceptance.** Splitting tensile strength tests shall not be used as a basis for field acceptance of concrete.

**1905.2 Selection of concrete proportions.** Concrete proportions shall be determined in accordance with the provisions of Sections 1905.2.1 through 1905.2.4.

**1905.2.1 General.** Proportions of materials for concrete shall be established to provide:

1. Workability and consistency to permit concrete to be worked readily into forms and around reinforcement under the conditions of placement to be employed, without segregation or excessive bleeding.
2. Resistance to special exposures as required by Section 1904.
3. Conformance with the strength test requirements of Section 1905.6.

**1905.2.2 Different materials.** Where different materials are to be used for different portions of proposed work, each combination shall be evaluated.

**1905.2.3 Basis of proportions.** Concrete proportions shall be established in accordance with Section 1905.3 or Section 1905.4, and shall comply with the applicable requirements of Section 1904.

**1905.2.4 Mass concrete.** For areas of high-strength mass concrete, including but not limited to, 8,000 psi (55 158 kPa) or greater and the least dimension being equal to or greater than 36 inches (914 mm), as indicated on the construction documents, a thermal control plan complying with ACI 301, Section 8.1 and acceptable to the registered design professional of record shall be submitted by the contractor.

**1905.3 Proportioning on the basis of field experience and/or trial mixtures.** Concrete proportioning determined on the basis of field experience or trial mixtures shall be done in accordance with ACI 318, Section 5.3 and Sections 1905.3.1 through 1905.3.5 of this chapter.

**1905.3.1 Required Strength.** If the required  $f'_c$  is obtained for trial batch mixes prior to the date specified, the trial mix design may be approved by the registered design professional of record for the structural design.

**1905.3.2 Performance and approval.** Concrete mix designs shall be performed by an approved agency or by a concrete producer who is an approved fabricator authorized in accordance with Section 1704.2.2, and approved in accordance with the requirements of Sections 1905.3.2.1 through 1905.3.2.3.

**1905.3.2.1 Certification.** All mix designs submitted for review and approval in accordance with Section 1905.3.2.2 shall be certified by the director of the approved agency or the quality control manager of the approved fabricator that performed the tests used to substantiate the mix design. In addition all mix designs shall be signed by an owner or officer of the concrete production facility.

**1905.3.2.2 Review and approval.** All mixes shall be approved by the registered design professional of record and filed with the department prior to use in construction.

**1905.3.2.3 Distribution.** Copies of the approved mix design(s) shall be maintained at the construction site by the contractor and made available to the department

upon request. A copy of the approved mix design(s) shall be provided by the contractor to the licensed concrete testing laboratory performing the acceptance testing of the concrete at the construction site.

**1905.3.3 Test records and trial mixtures.** Field strength test records or trial mixtures used to determine  $f'_{cr}$  shall not be more than 24 months old measured from the date of batching, provided the materials are the same as those proposed for use and the concrete producer provides a written statement confirming the materials are the same as those proposed for use.

**1905.3.4 Materials.** The type and source of the materials used in the concrete shall be identified in the proposed concrete mix design. In order for materials in field strength test records or trial mixtures to be considered the same as those proposed for use, the materials shall, at a minimum, comply with the following:

1. Cementitious materials. Cementitious materials shall be used in the same quantities for each individual component and shall be of the same type and shall be from the same source and mill. Upon request, the concrete producer shall provide mill certificates for the cementitious materials proposed for use and cementitious materials represented by the field strength test records or trial mixtures to the registered design professional of record and the department.
2. Aggregates. Coarse and fine aggregates shall be the same nominal maximum size and shall be used in the same volume for each individual component.
3. Admixtures. Admixtures shall meet the requirements of the same admixture type in accordance with ASTM C 494 or ASTM C 260 and there shall be no change in air content or water content from the previously specified mix.

**Exception:** Addition or removal of retarding or accelerating admixtures as described in Section 1905.3.5 is acceptable.

4. Additional testing. Differences or changes in materials that are proposed for use, not meeting the requirements of Items 1 through 3 above, shall require new testing demonstrated by either field strength test records or trial mixtures.

**Exception:** Field changes to concrete proportions specified in Section 1905.3.5.

**1905.3.5 Field changes to concrete proportions.** Based on test data and observations during the course of construction, the following changes described in Sections 1905.3.5.1 and 1905.3.5.2 are permitted without requiring additional trial mixtures or field strength test records, provided:

1. There are no changes to the type and source of materials described in Section 1905.3.4;
2. Documentation of these changes are maintained by the concrete producer and the concrete contractor;

3. The changes described in Section 1905.3.5 cannot be used for the submission of an initial mix design to demonstrate that a previously prepared mix design meets strength or air content requirements that differ from the required concrete properties without new field strength test records or new trial mix designs;

4. Where required in Section 1905.3.5, documentation of these changes shall be submitted for acceptance to the registered design professional of record for the structural design by the concrete producer prior to use;

5. Copies of the revised mixtures shall be maintained at the construction site and provided to the licensed concrete testing laboratory performing the acceptance testing of concrete in accordance with Item 4 of Table 1704.4 of this code; and

6. The documentation required by Items 2 and 5 above shall be made available to the commissioner upon request.

**1905.3.5.1 Changes that do not require prior approval of the registered design professional of record for the structure.** The following admixture modifications to concrete proportions can be made without requiring prior acceptance by the registered design professional of record:

1. Air-entraining admixtures. Air-entraining admixture dosages can be increased or decreased as needed to obtain the air content specified in the construction documents.
2. Water reducing admixtures. Water reducing admixture dosages can be increased or decreased to produce the specified workability, provided that the design water is not exceeded and the changes do not segregate the concrete mix.

**1905.3.5.2 Changes that require prior approval of the registered design professional of record for the structure.** The following modifications to concrete proportions can be made only with prior acceptance by the registered design professional of record. Any added materials and the final mix proportions shall be indicated in a revised mix design submitted to the registered design professional of record prior to use:

1. Retarding and accelerating admixtures. Retarding and accelerating admixtures may be added to concrete mixtures or the dosage may be modified as needed to maintain practical set times.
2. Pigment. Pigment dosage may be adjusted to maintain uniform concrete color.
3. Fibers. Synthetic, glass or natural fibers may be added to the mix within the manufacturer recommended range. Any loss in workability shall be compensated with a water reducer.

**Exception:** Steel fibers may not be added to a concrete mixture without the performance of a new mix design.



4. Corrosion inhibitor. Corrosion inhibiting admixtures may be added, provided the corresponding adjustment of mix water remains within the limits of the required water/cementitious material ratio. The added materials and the revised design mix shall be submitted for review by the registered design professional of record for the structure prior to use.
5. Cementitious content and water-cementitious material ratio (w/cm). The cementitious content may be increased by a maximum of 12 percent, or the w/cm ratio may be decreased while maintaining the same cementitious content, but the w/cm and air content shall not be increased. Aggregate quantities shall be adjusted, as required, to maintain the mix proportion and yield.

**1905.4 Proportioning without field experience or trial mixtures.** Concrete proportioning determined without field experience or trial mixtures shall be done in accordance with ACI 318, Section 5.4. This method of proportioning shall not be permitted for:

1. Load-carrying structural concrete where the total volume of concrete on a given project exceeds 50 cubic yards (38 m<sup>3</sup>); or
2. Structural or non-structural concrete mix proportions that will be exposed to exposure classes S1, P1, or C2.

**1905.5 Average strength reduction.** As data become available during construction, it is permissible to reduce the amount by which the average compressive strength ( $f'_c$ ) is required to exceed the specified value of  $f'_c$  in accordance with ACI 318, Section 5.5. A new mix design shall be submitted to the registered design professional of record for approval prior to use.

**1905.6 Evaluation and acceptance of concrete.** The criteria for evaluation and acceptance of concrete shall be as specified in Sections 1905.6.2 through 1905.6.5.5.

**1905.6.1 Acceptance testing.** Concrete shall be tested in accordance with the requirements in Sections 1905.6.2 through 1905.6.5. Concrete sampling and testing for acceptance shall be deemed a special inspection performed by a licensed concrete testing laboratory as an approved agency. An approved agency shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory and record the temperature of the fresh concrete when preparing specimens for strength tests. All field sampling and testing, including the testing of aggregates, concrete mixes, and strength testing of specimens, shall be subject to special inspection by an approved agency. All testing laboratories shall be approved agencies and shall employ qualified special inspectors to perform all required field and laboratory tests. Test results shall be promptly distributed by the testing laboratory to the registered design professional of record, concrete producer, owner and contractor to allow for corrective action where the concrete is found to be noncompliant† with the mix design or noncompliant† with the requirements otherwise specified in this code.

Unless more prompt action is required, test results shall be reported no less than 7 business days after the date of the respective tests were performed.

**1905.6.2 Frequency of testing.** The frequency of conducting strength tests of concrete shall be as specified in Sections 1905.6.2.1 through 1905.6.2.4.

**1905.6.2.1 Minimum frequency.** For the first 250 cubic yards of each class of concrete placed each day, samples for strength tests of each such class shall be taken: (i) not less than once a day; (ii) not less than once for each 50 cubic yards (38 m<sup>3</sup>) of concrete; and (iii) not less than once for each 5,000 square feet (465 m<sup>2</sup>) of surface area for slabs or walls. After the first 250 cubic yards (191 m<sup>3</sup>), samples for strength tests of each class of concrete placed each day shall be taken once for each additional 150 cubic yards (115 m<sup>3</sup>). For structural concrete exposed to exposure class C2, additional field testing of the concrete for water content per AASHTO T318 shall be required. At the discretion of the registered design professional of record, the frequency of testing may be reduced, but not less than once for each 150 cubic yards (115 m<sup>3</sup>).

**1905.6.2.2 Minimum number.** On a given project, if the total volume of concrete is such that the frequency of testing required by Section 1905.6.2.1 would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

**1905.6.2.3 Small volume.** When the total volume of concrete is less than 50 cubic yards (38 m<sup>3</sup>) on a given project, testing may be waived by the registered design professional of record.

**1905.6.2.4 Strength test.** A strength test shall be the average of the strengths of two 6 inch by 12 inch (152 mm by 304.8 mm) or two 4 inch by 8 inch (102 mm by 203 mm)† cylinders made from the same sample of concrete and tested at 28 days or at the test age designated for the determination of  $f'_c$ . Consideration shall be given specifying an  $f'_c$  at 56 days or later for concrete utilizing pozzolans in the mix proportions. At the discretion of the registered design professional of record or the approved agency performing the testing, additional pairs of test cylinders may be taken at the time of sampling for testing at a later date. The additional cylinders may be tested at a later date should the strength at the specified date not meet the required  $f'_c$ .

**1905.6.3 Standard-cured specimens.** Standard-cured specimens shall comply with the provisions of Sections 1905.6.3.1 through 1905.6.3.9.

**1905.6.3.1 Mix Design.** The special inspector shall verify that the proportions indicated on the batch ticket for the concrete delivered to the construction site are as per the approved concrete mix design prior to concrete placement (see Table 1704.4 of this code). Concrete that does not meet the requirements of the approved concrete mix design shall be rejected.



**1905.6.3.2 Sampling.** Samples for strength tests shall be taken in accordance with ASTM C 172.

**1905.6.3.3 Cylinders.** Cylinders for strength tests shall be molded and standard-cured in accordance with ASTM C 31. The contractor shall be responsible for providing the specified field storage curing facility and for monitoring the temperature as defined in ASTM C 31.

**1905.6.3.3.1 On-site curing.** The contractor shall be responsible for providing the specified field storage curing facility and for monitoring the temperature of the cylinders as defined in ASTM C 31.

**1905.6.3.3.2 Final curing.** Cylinders shall be placed in final curing conditions meeting the requirements of ASTM C 511. Cylinders shall be transported to final curing conditions by the licensed concrete testing laboratory within 48 hours of casting the cylinders.

**1905.6.3.3.3 Compressive strength testing.** The cylinders shall be tested in accordance with ASTM C 39.

**1905.6.3.4 Evaluation of results.** The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:

1. Every arithmetic average of any three consecutive strength tests equals or exceeds  $f'_c$ .
2. No individual strength test (average of two cylinders) falls below  $f'_c$  by more than 500 psi (3.45 MPa) when  $f'_c$  is 5,000 psi (34.50 MPa) or less, or by more than 0.10  $f'_c$  when  $f'_c$  is more than 5,000 psi (34.50 MPa).

**1905.6.3.5 Correction.** If either of the requirements of Section 1905.6.3.3 is not met, steps shall be taken to increase the average of subsequent strength test results. The requirements of Section 1905.6.5 shall govern if the requirement of Section 1905.6.3.6, Item 2, is not met.

**1905.6.3.6 Field testing.** Each time concrete is sampled for strength testing, the tests set forth in Items 1 through 5 shall be performed by the approved agency:

1. Temperature in accordance with ASTM C 1064.
2. Slump in accordance with ASTM C 143.
3. Unit weight in accordance with ASTM C 138.
4. Air content in accordance with ASTM C 173 or C 231. Testing in accordance with ASTM C 173 must be used for concretes made with lightweight aggregates, and other instances where ASTM C 231 is not applicable.
5. Water content per AASHTO T 318 when required by 1905.6.2.1.

**1905.6.3.7. Mass concrete.** For mass concrete sections identified as requiring monitoring, install temperature devices that are capable of measuring the temperature of the concrete continuously and record temperature data in increments that do not exceed 30 minutes for a

minimum period of seven days per ACI 301 Section 8.3 or as otherwise directed by the registered design professional of record.

**1905.6.3.8 Results of field tests.** The approved agency shall immediately report the results of field tests performed to the contractor and concrete truck driver, or other representative of the concrete producer. If at any time during the concrete operations, the concrete is not in conformance with ASTM C 94, this code, or is otherwise compromised, it shall be rejected. If it is placed, the location of the load shall be recorded and a pair of cylinders shall be molded from the load per ASTM C 31 and included in the average  $f'_c$ . The approved agency shall keep a written record of all field tests at the construction site and make the records available upon request. These results need not be used in calculating the arithmetic average of consecutive test results required by Section 1905.6.3.4.

**1905.6.3.9 Reporting requirements.** Field sampling and testing shall be deemed a special inspection, and the approved agency performing the field sampling and testing of concrete at the construction site shall be subject to the requirements of Section 1704.1.2 regarding reporting of deficiencies.

**1905.6.4 Field-cured specimens.** Field-cured specimens shall comply with the provisions of Sections 1905.6.4.1 through 1905.6.4.4.

**1905.6.4.1 When required.** Where required by the commissioner, the results of strength tests of cylinders cured under field conditions shall be provided to the department.

**1905.6.4.2 Curing.** Field-cured cylinders shall be cured under field conditions in accordance with ASTM C 31.

**1905.6.4.3 Sampling.** Field-cured test cylinders shall be molded at the same time and from the same samples as laboratory-cured test cylinders.

**1905.6.4.4 Correction.** Procedures for protecting and curing concrete shall be improved when the strength of field-cured cylinders at the test age designated for determination of  $f'_c$  is less than 85 percent of that of companion laboratory-cured cylinders. The 85-percent limitation shall not apply if the field-cured strength exceeds  $f'_c$  by more than 500 psi (3.45 MPa).

**1905.6.5 Low-strength test results.** The investigation of low-strength test results shall be in accordance with the provisions of Sections 1905.6.5.1 through 1905.6.5.5.

**1905.6.5.1 Precaution.** If any strength test of laboratory-cured cylinders performed in accordance with Section 1905.6.2.4 falls below the specified value of  $f'_c$  by more than the values given in Section 1905.6.3.6, Item 2, or if tests of field-cured cylinders performed in accordance with Section 1905.6.4.4 indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized.

**1905.6.5.2 Core tests.** Where calculations indicate that load-carrying capacity is significantly reduced, tests of cores drilled from the area in question in accordance with ASTM C 42 shall be permitted. In such cases, three cores shall be taken for each strength test that falls below the values given in Section 1905.6.4.3, Item 2.

**1905.6.5.3 Condition of cores.** Cores shall be prepared for transport and storage by wiping drilling water from their surfaces and placing the cores in water-tight bags or containers immediately after drilling. Cores shall be tested not earlier than 48 hours nor later than seven days after coring unless approved by the registered design professional of record.

**1905.6.5.4 Test results.** Concrete in an area represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85 percent of  $f'_c$  and if no single core is less than 75 percent of  $f'_c$ . Additional testing of cores extracted from locations represented by erratic core strength results is permitted.

**1905.6.5.5 Strength evaluation.** If the criteria of Section 1905.6.5.4 are not met and the structural adequacy remains in doubt, the commissioner may order a strength evaluation in accordance with ACI 318, Chapter 20, for the questionable portion of the structure, or take other appropriate action. The registered design professional of record shall present to the commissioner a complete analysis showing the final safe load-carrying capacity of the questionable portion of the structure including any proposed remedial actions necessary for review and approval.

**1905.6.6 Steel fiber-reinforced concrete.** Steel fiber-reinforced concrete used in beams shall be subject to the requirements of ACI 318, Section 5.6.6. The required testing and inspection of steel fiber-reinforced concrete shall be deemed a special inspection. Steel fibers shall not be used in place of required reinforcing bars.

**1905.7 Preparation of equipment and place of deposit.** Preparation before concrete placement shall include the following:

1. Equipment for mixing and transporting concrete shall be clean.
2. Debris and ice shall be removed from spaces to be occupied by concrete.
3. Forms shall be properly coated.
4. Masonry filler units that will be in contact with concrete shall be well drenched.
5. Reinforcement shall be thoroughly clean of ice or other deleterious coatings.
6. Water shall be removed from the place of deposit before concrete is placed unless a tremie is to be used or unless otherwise permitted by the commissioner.
7. Laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.

**1905.8 Mixing.** Mixing of concrete shall be performed in accordance with Sections 1905.8.1 through 1905.8.3.

**1905.8.1 General.** Concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before the mixer is recharged. Concrete delivered shall be proportioned in accordance with Section 1905.2.3. Modification to the approved concrete proportions shall be based upon standards acceptable to the commissioner.

**1905.8.2 Ready-mixed concrete.** Ready-mixed concrete shall be mixed and delivered in accordance with the requirements of ASTM C 94 or ASTM C 685.

**1905.8.2.1 Concrete plants.** Concrete plants shall be certified by the National Ready Mixed Concrete Association (NRMCA), the Concrete Industry Board Concrete Producer Certification Program, or other program acceptable to the department, and shall comply with the rules of the department. Concrete producers shall have their plants inspected quarterly and have their scales and trucks certified. In fulfilling this certification requirement, the concrete producer may present certification by either a New York City government agency, or by the New York State Department of Transportation subject to the approval of the commissioner.

**1905.8.2.2 Delivery personnel.** Concrete ready-mix truck drivers shall be certified by the NRMCA and shall comply with the rules of the department.

**1905.8.2.3 Batch tickets.** Batch tickets shall accompany every load of concrete delivered to a site. The batch ticket shall contain the information specified in Items 1 through 7:

1. Plant name and location.
2. Contract number and project.
3. Mix designation as to type and strength.
4. Each material in the load along with quantities of each by weight.
5. The total amount of mix proportion water approved, quantity of water added at the plant and in transit, and the remaining water that can be added on site.
6. Any deviations from the approved concrete mix design and variations permitted by Section 1905.3.5.
7. The time the water was added to the batch.

**1905.8.2.3.1 Copies of batch tickets.** A copy of each batch ticket shall be given to the licensed concrete testing laboratory special inspector performing the acceptance testing at the delivery of each load. The licensed laboratory shall maintain copies of the batch tickets along with other inspection reports required by Section 1704.1, and make them available to the department upon request.

**1905.8.3 Job-mixed concrete.** Job-mixed concrete shall comply with ACI 318, Section 5.8.3.

**1905.9 Conveying.** The method and equipment for conveying concrete to the place of deposit shall comply with Sections 1905.9.1 and 1905.9.2.

**1905.9.1 Method of conveyance.** Concrete shall be conveyed from the mixer to the place of final deposit by methods that will prevent separation or loss of materials that may alter the properties of the concrete delivered. Cylinders shall be made to determine the quality of concrete. Such cylinders shall be made at the truck or at the point of placement of the concrete as determined by the special inspection agency or the registered design professional of record.

**1905.9.2 Conveying equipment.** The conveying equipment shall be capable of providing a supply of concrete at the site of placement without separation of ingredients and without interruptions sufficient to permit the loss of plasticity between successive increments.

**1905.10 Depositing.** The depositing of concrete shall comply with the provisions of Sections 1905.10.1 through 1905.10.8.

**1905.10.1 Segregation.** Concrete shall be deposited as nearly as practicable to its final position to avoid segregation due to rehandling or flowing.

**1905.10.2 Placement timing.** Concreting operations shall be carried on at such a rate that the concrete is at all times plastic and flows readily into spaces between reinforcement.

**1905.10.3 Unacceptable concrete.** Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.

**1905.10.4 Retempering.** Retempered concrete or concrete that has been remixed after initial set shall not be used.

**1905.10.5 Continuous operation.** After concreting has started, it shall be carried on as a continuous operation until placing of a panel or section, as defined by its boundaries or predetermined joints, is completed, except as permitted or prohibited by Section 1906.4.

**1905.10.6 Placement in vertical lifts.** The top surfaces of vertically formed lifts shall be generally level.

**1905.10.7 Construction joints.** When construction joints are required, they shall be made in accordance with Section 1906.4.

**1905.10.8 Consolidation.** Concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures and into corners of the forms.

**1905.11 Curing.** The curing of concrete shall be in accordance with Sections 1905.11.1 through 1905.11.3.

**1905.11.1 Regular.** Concrete (other than high early strength) shall be maintained above 50°F (10°C) and in a moist condition for at least the first seven days after placement, except when cured in accordance with Section 1905.11.3.

**1905.11.2 High-early-strength.** High-early-strength concrete shall be maintained above 50°F (10°C) and in a moist condition for at least the first three days, except when cured in accordance with Section 1905.11.3.

**1905.11.3 Accelerated curing.** Accelerated curing of concrete shall comply with ACI 318, Section 5.11.3.

**1905.12 Cold weather requirements.** Concrete that is to be placed during freezing or near-freezing weather shall comply with the following:

1. Adequate equipment shall be provided for insulating or heating concrete materials and protecting concrete during freezing or near-freezing weather.
2. Concrete materials and reinforcement, forms, fillers and ground with which concrete is to in contact shall be free from frost. The temperature of surfaces in contact with fresh concrete, including but not limited to forms and reinforcing steel, shall be raised above freezing.
3. Frozen materials or materials containing ice shall not be used.

**1905.13 Hot weather requirements.** During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection and curing to prevent excessive concrete temperatures or water evaporation that could impair the required strength or serviceability of the member or structure.

## SECTION BC 1906 FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

**1906.1 Formwork.** The design, fabrication and erection of forms shall comply with the requirements of Section 3305.3 of this code and with ACI 318, Section 6.1.

**1906.2 Removal of forms, shores and reshores.** The removal of forms and shores, including slabs and beams (except where cast on the ground), and the installation of reshores shall comply with Section 3305.3 of this code and ACI 318, Section 6.2.

**1906.3 Conduits and pipes embedded in concrete.** Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3, are permitted to be embedded in concrete with approval of the registered design professional of record.

**1906.4 Construction joints.** Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4. Construction joints including their location shall be approved by the registered design professional of record prior to installation.

## SECTION BC 1907 DETAILS OF REINFORCEMENT

**1907.1 Hooks.** Standard hooks on reinforcing bars used in concrete construction shall comply with ACI 318, Section 7.1.



**1907.2 Minimum bend diameters.** Minimum reinforcement bend diameters utilized in concrete construction shall comply with ACI 318, Section 7.2.

**1907.3 Bending.** The bending of reinforcement shall comply with Sections 1907.3.1 and 1907.3.2.

**1907.3.1 Cold bending.** Reinforcement shall be bent cold, unless otherwise permitted by the registered design professional of record.

**1907.3.2 Embedded reinforcement.** Reinforcement partially embedded in concrete shall not be field bent, except as shown on the construction documents or permitted by the registered design professional of record.

**1907.4 Surface conditions of reinforcement.** The surface conditions of reinforcement shall comply with the provisions of Sections 1907.4.1 through 1907.4.3.

**1907.4.1 Coatings.** At the time concrete is placed, reinforcement shall be free from mud, oil or other nonmetallic coatings that decrease bond. Zinc and epoxy-coating of steel reinforcement in accordance with ACI 318, Sections 3.5.3.8, 3.5.3.9, and 3.5.3.10 shall be permitted.

**1907.4.2 Rust or mill scale.** Except for prestressing steel, steel reinforcement with rust, mill scale or a combination of both, shall be permitted, provided the minimum dimensions, including height of deformations and weight of a hand-wire-brushed test specimen, comply with applicable ASTM specifications specified in Section 1903.5.

**1907.4.3 Prestressing steel.** Prestressing steel shall be clean and free of oil, dirt, scale, pitting and excessive rust. A light coating of rust is permitted.

**1907.5 Placing reinforcement.** The placement of concrete reinforcement shall comply with the provisions of Sections 1907.5.1 through 1907.5.4.

**1907.5.1 Support.** Reinforcement, including tendons, and post tensioning ducts shall be accurately placed and adequately supported before concrete is placed, and shall be secured against displacement within tolerances permitted in Section 1907.5.2. Where approved by the registered design professional of record, embedded items (such as dowels or inserts) that either protrude from precast concrete members or remain exposed for inspection are permitted to be embedded while the concrete is in a plastic state, provided the following conditions are met:

1. Embedded items are maintained in the correct position while the concrete remains plastic.
2. The concrete is properly consolidated around the embedded item. Embedded items are not required to be hooked or tied to reinforcement within the concrete.

**1907.5.2 Tolerances.** Unless otherwise specified by the registered design professional of record, reinforcement, including tendons, and post tensioning ducts shall be

placed within the tolerances specified in Sections 1907.5.2.1 and 1907.5.2.2.

**1907.5.2.1 *d* and cover.** Tolerance for *d* and concrete cover in flexural members, walls and compression members shall be as shown in Table 1907.5.2.1, except that tolerance for the clear distance to formed soffits shall be minus  $\frac{1}{4}$  inch (6.4 mm) and tolerance for cover shall not exceed minus one-third the concrete cover specified in the design drawings or specifications.

**TABLE 1907.5.2.1  
TOLERANCES**

DEPTH ( <i>d</i> ) (inches)	TOLERANCE ON <i>d</i> (inch)	TOLERANCE ON SPECIFIED CONCRETE COVER
$d \leq 8$	$\pm \frac{3}{8}$	$- \frac{3}{8}$
$d > 8$	$\pm \frac{1}{2}$	$- \frac{1}{2}$

For SI: 1 inch = 25.4 mm.

**1907.5.2.2 Bends and ends.** Tolerance for longitudinal location of bends and ends of reinforcement shall be  $\pm 2$  inches ( $\pm 51$  mm) except the tolerance shall be  $\pm \frac{1}{2}$  inch ( $\pm 12.7$  mm) at the discontinuous ends of brackets and corbels, and  $\pm 1$  inch (25 mm) at the discontinuous ends of other members. The tolerance for concrete cover of Section 1907.5.2.1 shall also apply at discontinuous ends of members.

**1907.5.3 Welded wire reinforcement.** Welded wire reinforcement with wire size not greater than W5 or D5 used in slabs not exceeding 10 feet (3048 mm) in span is permitted to be curved from a point near the top of the slab over the support to a point near the bottom of the slab at midspan, provided such reinforcement is either continuous over, or securely anchored at support.

**1907.5.4 Welding.** Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized by the registered design professional of record.

**1907.6 Spacing limits for reinforcement.** The clear distance between reinforcing bars, bundled bars, tendons and ducts shall comply with ACI 318, Section 7.6.

**1907.7 Concrete protection for reinforcement.** The minimum concrete cover for reinforcement shall comply with Sections 1907.7.1 through 1907.7.8.

**1907.7.1 Cast-in-place concrete (nonprestressed).** Minimum specified concrete cover shall be provided for reinforcement in nonprestressed, cast-in-place concrete construction in accordance with Table 1907.7.1, but shall not be less than required by Sections 1907.7.6 and 1907.7.8.



TABLE 1907.7.1  
MINIMUM CONCRETE COVER

CONCRETE EXPOSURE		MINIMUM COVER (inches)
1.	Concrete cast against and permanently exposed to earth	3
2.	Concrete exposed to earth or weather No. 6 through No. 18 bar No. 5 bar, W31 or D31 wire, and smaller	2 1½
3.	Concrete not exposed to weather or in contact with ground Slabs, walls, joists: No. 14 and No. 18 bars No. 11 bar and smaller Beams, columns: Primary reinforcement, ties, stirrups, spirals Shells, folded plate members: No. 6 bar and larger No. 5 bar, W31 or D31 wire, and smaller	1½ ¾ 1½ ¾ 1½

For SI: 1 inch = 25.4 mm.

**1907.7.2 Cast-in-place concrete (prestressed).** The minimum specified concrete cover for prestressed and nonprestressed reinforcement, ducts and end fittings in cast-in-place prestressed concrete shall comply with ACI 318, Section 7.7.2.

**1907.7.3 Precast concrete (manufactured under plant control conditions).** The minimum specified concrete cover for prestressed and nonprestressed reinforcement, ducts and end fittings in precast concrete manufactured under plant control conditions shall comply with ACI 318, Section 7.7.3.

**1907.7.4 Bundled bars.** The minimum specified concrete cover for bundled bars shall comply with ACI 318, Section 7.7.4.

**1907.7.5 Headed shear stud reinforcement.** For headed shear stud reinforcement, the minimum specified concrete cover shall comply with ACI 318, Section 7.7.5.

**1907.7.6 Corrosive environments.** In corrosive environments or other severe exposure conditions, prestressed and nonprestressed reinforcement shall be provided with additional protection in accordance with ACI 318, Section 7.7.6.

**1907.7.7 Future extensions.** Exposed reinforcement, inserts and plates intended for bonding with future extensions shall be protected from corrosion.

**1907.7.8 Fire protection.** When this code requires a thickness of cover for fire protection greater than the minimum concrete cover in Section 1907.7, such greater thickness shall be specified on the construction documents.

**1907.8 Special reinforcement details for columns.** Offset bent longitudinal bars in columns and load transfer in structural steel cores of composite compression members shall comply with the provisions of ACI 318, Section 7.8.

**1907.9 Connections.** Connections between concrete framing members shall comply with the provisions of ACI 318, Section 7.9.

**1907.10 Transverse reinforcement for compression members.** Transverse reinforcement for compression members shall comply with the provisions of ACI 318, Section 7.10.

**1907.11 Transverse reinforcement for flexural members.** Transverse reinforcement for compression reinforcement in flexural members shall comply with the provisions of ACI 318, Section 7.11.

**1907.12 Shrinkage and temperature reinforcement.** Reinforcement for shrinkage and temperature stresses in concrete members shall comply with the provisions of ACI 318, Section 7.12.

**1907.13 Requirements for structural integrity.** The detailing of reinforcement and connections between concrete members shall comply with the provisions of ACI 318, Section 7.13.

## SECTION BC 1908 MODIFICATIONS TO ACI 318

**1908.1 General.** The text of ACI 318 shall be modified as indicated in Sections 1908.1.1 through 1908.1.7.

**1908.1.1 ACI 318, Section 2.2.** Modify existing definitions and add the following definitions to ACI 318, Section 2.2.

**DESIGN DISPLACEMENT.** Total lateral displacement expected for the design-basis earthquake, as specified by Section 12.8.6 of ASCE 7.

**DETAILED PLAIN CONCRETE STRUCTURAL WALL.** A wall complying with the requirements of Chapter 22, including 22.6.7.

**ORDINARY PRECAST STRUCTURAL WALL.** A precast wall complying with the requirements of Chapters 1 through 18.

**ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.** A cast-in-place wall complying with the requirements of Chapters 1 through 18.

**ORDINARY STRUCTURAL PLAIN CONCRETE WALL.** A wall complying with the requirements of Chapter 22, excluding 22.6.7.

**SPECIAL STRUCTURAL WALL.** A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."

**WALL PIER.** A wall segment with a horizontal length-to-thickness ratio of at least 2.5, but not exceeding six, whose clear height is at least two times its horizontal length.

**1908.1.2 ACI 318, Section 21.1.1.** Modify Sections 21.1.1.3 and 21.1.1.7 to read as follows:

21.1.1.3 – Structures assigned to Seismic Design Category A shall satisfy requirements of Chapters 1 to 19

NYC	and 22; Chapter 21 does not apply. Structures assigned to Seismic Design Category B, C, or D also shall satisfy 21.1.1.4 through 21.1.1.8, as applicable. Except for structural elements of plain concrete complying with Section 1908.1.8 of the <i>New York City Building Code</i> , structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category C or D.	2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.	
NYC			
NYC		21.4.7 – Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.	
NYC	21.1.1.7 – Structural systems designated as part of the seismic-force-resisting system shall be restricted to those permitted by ASCE 7 as modified by Chapter 16 of the <i>New York City Building Code</i> . Except for Seismic Design Category A, for which Chapter 21 does not apply, the following provisions shall be satisfied for each structural system designated as part of the seismic-force-resisting system, regardless of the Seismic Design Category:	<b>1908.1.4 ACI 318, Section 21.9.</b> Modify ACI 318, Section 21.9.8, by deleting Section 21.9.8 and replacing with the following:	NYC NYC
NYC	(a) Ordinary moment frames shall satisfy 21.2.	21.9.8 Wall piers and wall segments.	NYC
NYC	(b) Ordinary reinforced concrete structural walls and ordinary precast structural walls need not satisfy any provisions in Chapter 21.	21.9.8.1 Wall piers not designed as a part of a special moment frame shall have transverse reinforcement designed to satisfy the requirements in Section 21.9.8.2.	NYC NYC
	(c) Intermediate moment frames shall satisfy 21.3.	<b>Exceptions:</b>	
	(d) Intermediate precast structural walls shall satisfy 21.4.	1. Wall piers that satisfy Section 21.13.	
	(e) Special moment frames shall satisfy 21.5 through 21.8.	2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers, and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.	
	(f) Special structural walls shall satisfy 21.9.	21.9.8.2‡ Transverse reinforcement with seismic hooks at both ends shall be designed to resist the shear forces determined from Sections 21.6.5.1. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).	NYC NYC
	(g) Special structural walls constructed using precast concrete shall satisfy 21.10.	21.9.8.3 Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as columns.	NYC
	All special moment frames and special structural walls shall also satisfy 21.1.3 through 21.1.7.	<b>1908.1.5 ACI 318, Section 21.10.2.</b> Modify ACI 318, Section 21.10.2, to read as follows:	
NYC	<b>1908.1.3 ACI 318, 21.4.</b> Modify ACI 318, Section 21.4, by renumbering Section 21.4.3 to become 21.4.4 and adding new Sections 21.4.3, 21.4.5, 21.4.6, and 21.4.7 to read as follows:	21.10.2 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 21.9 for cast-in-place special structural walls in addition to Sections 21.4.2 through 21.4.4.	
NYC	21.4.3 – Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.	<b>1908.1.6 ACI 318, Section 21.12.1.1.</b> Modify ACI 318, Section 21.12.1.1, to read as follows:	
NYC	21.4.4 – Elements of the connection that are not designed to yield shall develop at least 1.5 <i>S<sub>y</sub></i> .	21.12.1.1 Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and the ground shall comply with the requirements of Section 21.10 and other applicable provisions of ACI 318 unless modified by Chapter 18 of the <i>New York City Building Code</i> .	NYC NYC
NYC	21.4.5 – Wall piers in Seismic Design Category D shall comply with section 1908.1.4 of the <i>New York City Building Code</i> .	<b>1908.1.7 ACI 318, Section 22.6.</b> Modify ACI 318, Section 22.6 by adding new 22.6.7 to read as follows:	NYC
NYC	21.4.6 – Wall piers not designed as part of a moment frame in buildings assigned to Seismic Design Category C shall have transverse reinforcement designed to resist the shear forces determined from 21.3.3. Spacing of transverse reinforcement shall not exceed 8 inches (203 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).	22.6.7 – Detailed plain concrete structural walls.	
	<b>Exceptions:</b>	22.6.7.1 – Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 22.6.7.2.	
	1. Wall piers that satisfy 21.13.		

22.6.7.2 – Reinforcement shall be provided as follows:

- (a) Vertical reinforcement of at least 0.20 square inch (129 mm<sup>2</sup>) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 22.6.6.5.
- (b) Horizontal reinforcement at least 0.20 square inch (129 mm<sup>2</sup>) in cross-sectional area shall be provided:
  1. Continuously at structurally connected roof and floor levels and at the top of walls;
  2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall; and
  3. At a maximum spacing of 120 inches (3048 mm).

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall.

**1908.1.8 ACI 318, Section 22.10.** Delete ACI 318, Section 22.10, and replace with the following:

22.10 – Plain concrete in structures assigned to Seismic Design Category C or D.

22.10.1 – Structures assigned to Seismic Design Category C or D shall not have elements of structural plain concrete, except as follows:

- (a) Structural plain concrete basement, foundation or other walls below the base are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall not be less than 7½ inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 22.6.6.5.
- (b) Isolated footings of plain concrete supporting pedestals or columns are permitted, provided the projection of the footing beyond the face of the supported member does not exceed the footing thickness.

**Exception:** In detached one- and two-family dwellings three stories or less in height, the projection of the footing beyond the face of the supported member is permitted to exceed the footing thickness.

- (c) Plain concrete footings supporting walls are permitted, provided the footings have at least

two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, a minimum of one bar shall be provided at the top and bottom of the footing. Continuity of reinforcement shall be provided at corners and intersections.

**Exceptions:**

1. In Seismic Design Categories A, B and C, detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement. NYC  
NYC
2. For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, a minimum of one bar shall be provided at the top of the stem wall and at the bottom of the footing. NYC
3. Where a slab on ground is cast monolithically with the footing, one No. 5 bar is permitted to be located at either the top of the slab or bottom of the footing. NYC

**1908.1.9 ACI 318, Section D.3.3.** Modify ACI 318, Sections D.3.3.4.2, D.3.3.4.3(d), and D.3.3.5.2 to read as follows: NYC

D.3.3.4.2 - Where the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with Section† D.3.3.4.3. The anchor design tensile strength shall be determined in accordance with Section† D.3.3.4.4. NYC  
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**Exception:** Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7-10 Equation 12.11-1 or 12.14 -10 shall be deemed to satisfy Section D.3.3.4.3(d). NYC  
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D.3.3.4.3(d) – The anchor or group of anchors shall be designed for the maximum tension obtained from design load combinations that include E, with E increased by  $\Omega_0$ . The anchor design tensile strength shall be calculated from Section† D.3.3.4.4. NYC  
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D.3.3.5.2 – Where the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their NYC  
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attachments shall be designed in accordance with Section† D.3.3.5.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with Section† D.6.

#### Exceptions:

1. For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with Sections† D.6.2 and D.6.3 need not be computed and Section† D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

- 1.1. The allowable in-plane shear strength of the anchor is determined in accordance with AF&PA NDS Table 11E for lateral design values parallel to grain.
- 1.2. The maximum anchor nominal diameter is  $\frac{5}{8}$  inches (16 mm).
- 1.3. Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).
- 1.4. Anchor bolts are located a minimum of  $1\frac{3}{4}$  inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.
- 1.5. Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.
- 1.6. The sill plate is of 2-inch or 3-inch nominal thickness.

2. For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with Sections† D.6.2 and D.6.3 need not be computed and Section† D.3.3.5.3 shall be deemed to be satisfied provided all of the following are met:

- 2.1. The maximum anchor nominal diameter is  $\frac{5}{8}$  inches (16 mm).
- 2.2. Anchors are embedded into concrete a minimum of 7 inches (178 mm).
- 2.3. Anchors are located a minimum of  $1\frac{3}{4}$  inches (45 mm) from the edge of the concrete parallel to the length of the track.
- 2.4. Anchors are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the track.
- 2.5. The track is 33 to 68 mil designation thickness. Allowable in-plane shear

strength of exempt anchors, parallel to the edge of concrete shall be permitted to be determined in accordance with AISI S100 Section E3.3.1.

3. In light-frame construction, bearing or non-bearing walls, shear strength of concrete anchors less than or equal to 1 inch (25 mm) in diameter connecting sill plate or track to foundation or foundation stem wall need not satisfy Section† D.3.3.5.3(a) through (c) when the design strength of the anchors is determined in accordance with Section† D.6.2.1(c).

#### 1908.1.10 Reserved.

**1908.1.11 ACI 318, Section 9.5.2.3.** Add the following to section 9.5.2.3:

“When calculating  $M_a$ , consideration shall be given to loads imposed during construction.”

**1908.2 General.** The text of ACI 318 shall be modified as indicated in Sections 1908.2.1 through 1908.2.4.

**1908.2.1 ACI 318, Section 10.12.** Modify ACI 318 by adding Section 10.12.4 to read as follows:

10.12.4 When the specified compressive strength of concrete in a column is greater than 1.4 times that specified for a floor system, the following additional requirements shall be adhered to:

1. All of the design provisions of Section 10.12 (unmodified) are adhered to.
2. The concrete construction is supervised and inspected continuously by a full-time professional engineer responsible for the concrete placement special inspection. Such professional engineer shall not delegate this responsibility to any subordinates.

### SECTION BC 1909 STRUCTURAL PLAIN CONCRETE

**1909.1 Scope.** The design and construction of structural plain concrete, both cast-in-place and precast, shall comply with the minimum requirements of Section 1909 and ACI 318, Chapter 22, as modified by Section 1908 of this chapter. NYC

**1909.1.1 Special structures.** For special structures, such as arches, underground utility structures, gravity walls and shielding walls, the provisions of Section 1909 shall govern where applicable. NYC

**1909.2 Limitations.** The use of structural plain concrete columns and structural plain concrete footings on piles is not permitted. In addition to the limitations set forth in Section 1908.1.8 of this chapter, the use of structural plain concrete shall otherwise be limited to: NYC

1. Members that are continuously supported by soil, such as walls and footings, or by other structural members capable of providing continuous vertical support.



2. Members for which arch action provides compression under all conditions of loading.
3. Walls and pedestals.

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**1909.3 Joints.** Contraction or isolation joints shall be provided to divide structural plain concrete members into flexurally discontinuous elements in accordance with ACI 318, Section 22.3.

**1909.4 Design.** Structural plain concrete walls, footings and pedestals shall be designed for adequate strength in accordance with ACI 318, Sections 22.4 through 22.8.

**Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above grade plane of light-frame construction, the required edge thickness of ACI 318 is permitted to be reduced to 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.

**1909.5 Precast members.** The design, fabrication, transportation and erection of precast, structural plain concrete elements shall be in accordance with ACI 318, Section 22.9.

**1909.6 Walls.** In addition to the requirements of this section, structural plain concrete walls shall comply with the applicable requirements of ACI 318, Chapter 22.

**1909.6.1 Basement walls.** The thickness of exterior basement walls and foundation walls shall be not less than  $7\frac{1}{2}$  inches (191 mm).

NYC

**1909.6.2 Other walls.** Except as provided in Section 1909.6.1, the thickness of bearing walls shall be not less than  $\frac{1}{24}$  the unsupported height or length, whichever is shorter, but not less than  $5\frac{1}{2}$  inches (140 mm).

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**1909.6.3 Openings in walls.** Not less than two No. 5 bars shall be provided around window and door openings. The bars shall be anchored to develop  $f_y$  in tension at the corners of openings.

## SECTION BC 1910 MINIMUM SLAB PROVISIONS

**1910.1 General.** The thickness of concrete floor slabs supported directly on the ground shall not be less than  $3\frac{1}{2}$  inches (89 mm). A 6-mil (0.006 inch; 0.152 mm) polyethylene vapor retarder with joints lapped not less than 6 inches (152 mm) shall be placed between the base course or subgrade and the concrete floor slab, or other acceptable equivalent methods or materials shall be used to retard vapor transmission through the floor slab.

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**Exception:** A vapor retarder is not required:

1. For detached structures accessory to occupancies in Group R-3, such as garages, utility buildings or other unheated facilities.
2. For unheated storage rooms having an area of less than 70 square feet ( $6.5 \text{ m}^2$ ) and carports attached to occupancies in Group R-3.
3. For buildings of other occupancies where migration of moisture through the slab from below will not be

detrimental to the intended occupancy of the building.

4. For drive ways, walks, patios and other flat work that will not be enclosed at a later date.

NYC

5. Where approved based on local site conditions.

## SECTION BC 1911 ANCHORAGE TO CONCRETE—ALLOWABLE STRESS DESIGN

**1911.1 Scope.** The provisions of this section shall govern the allowable stress design of headed bolts and headed stud anchors cast in normal-weight concrete for purposes of transmitting structural loads from one connected element to the other. These provisions do not apply to anchors installed in hardened concrete or where load combinations include earthquake loads or effects. The bearing area of headed anchors shall be not less than one and one-half times the shank area. Where strength design is used, or where load combinations include earthquake loads or effects, the design strength of anchors shall be determined in accordance with Section 1912. Bolts shall conform to ASTM A 307 or an acceptable equivalent.

NYC

**1911.2 Allowable service load.** The allowable service load for headed anchors in shear or tension shall be as indicated in Table 1911.2. Where anchors are subject to combined shear and tension, the following relationship shall be satisfied:

$$(P_s / P_t)^{5/3} + (V_s / V_t)^{5/3} \leq 1 \quad (\text{Equation 19-1})$$

where:

$P_s$  = Applied tension service load, pounds (N).

$P_t$  = Allowable tension service load from Table 1911.2, pounds (N).

$V_s$  = Applied shear service load, pounds (N).

$V_t$  = Allowable shear service load from Table 1911.2, pounds (N).

**1911.3 Required edge distance and spacing.** The allowable service loads in tension and shear specified in Table 1911.2 are for the edge distance and spacing specified. The edge distance and spacing are permitted to be reduced to 50 percent of the values specified with an equal reduction in allowable service load. Where edge distance and spacing are reduced less than 50 percent, the allowable service load shall be determined by linear interpolation.

**1911.4 Reserved.**

NYC

**1911.5 Increase for special inspection.** Where special inspection is provided for the installation of anchors, a 100-percent increase in the allowable tension values of Table 1911.2 is permitted. No increase in shear value is permitted.

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## SECTION BC 1912 ANCHORAGE TO CONCRETE—STRENGTH DESIGN

**1912.1 Scope.** The provisions of this section shall govern the strength design of anchors installed in concrete for purposes

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For SI: 1 inch = 25.4 mm, 1 pound per square inch = 0.00689MPa, 1 pound = 4.45 N.

**1913.4 Reinforcement.** Reinforcement used in shotcrete construction shall comply with the provisions of Sections 1913.4.1 through 1913.4.4.

**1913.4.2 Clearance.** When No. 5 or smaller bars are used, there shall be a minimum clearance between parallel reinforcement bars of 2½ inches (64 mm). When bars larger than No. 5 are permitted, there shall be a minimum clearance between parallel bars equal to six diameters of the bars used. When two curtains of steel are provided, the curtain nearer the nozzle shall have a minimum spacing equal to 12 bar diameters and the remaining curtain shall have a minimum spacing of six bar diameters.

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**1913.4.3 Splices.** Lap splices of reinforcing bars shall utilize the noncontact lap splice method with a minimum clearance of 2 inches (51 mm) between bars. The use of contact lap splices necessary for support of the reinforcing is permitted when approved by the commissioner, based on satisfactory preconstruction tests that show that adequate encasement of the bars will be achieved, and provided that the splice is oriented so that a plane through the center of the spliced bars is perpendicular to the surface of the shotcrete.

**1913.4.4 Spirally tied columns.** Shotcrete shall not be applied to spirally tied columns.

**1913.1 General.** Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface. Except as specified in this section, shotcrete shall conform to the requirements of this chapter for plain or reinforced concrete.

**1913.2 Proportions and materials.** Shotcrete proportions shall be selected that allow suitable placement procedures using the delivery equipment selected and shall result in finished in-place hardened shotcrete meeting the strength requirements of this code. Prior to using shotcrete, the mix design for shotcrete shall be performed by the contractor and shall be approved by the registered design professional of record. The approved mix design shall be filed with the department based upon preconstruction tests performed in accordance with Section 1913.5.

**1913.3 Aggregate.** Coarse aggregate, if used, shall not exceed  $\frac{3}{4}$  inch (19.1 mm).

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## SECTION BC 1914 REINFORCED GYPSUM CONCRETE

**1914.1 General.** Reinforced gypsum concrete shall comply with the requirements of ASTM C 317 and ASTM C 956.

**1914.2 Minimum thickness.** The minimum thickness of reinforced gypsum concrete shall be 2 inches (51 mm) except the minimum required thickness shall be reduced to 1½ inches (38 mm), provided the following conditions are satisfied:

1. The overall thickness, including the formboard, is not less than 2 inches (51 mm).
2. The clear span of the gypsum concrete between supports does not exceed 33 inches (838 mm).
3. Diaphragm action is not required.
4. The design live load does not exceed 40 pounds per square foot (psf) (1915 Pa).

**1914.3 Limitations of use.** Reinforced gypsum concrete shall not be used where exposed directly to the weather or where subject to frequent or continuous wetting. Precast units shall be protected by coverings or coatings from the weather and from contact with moisture during shipment and during storage at the work site.

## SECTION BC 1915 CONCRETE-FILLED STEEL COLUMNS

**1915.1 General.** Concrete-filled steel columns shall comply with Section 1915 and shall be filled with concrete so placed and manipulated as to secure maximum density and to ensure complete filling of the steel without voids.

**1915.2 Design.** The safe supporting capacity of concrete-filled steel columns shall be computed in accordance with ACI 318 and AISC 360 or as determined by a test approved by the commissioner.

**1915.3 Connections.** Caps, base plates and connections shall be in accordance with ACI 318 and AISC 360 and shall be positively attached to the shell and anchored to the concrete core. Welding of brackets without mechanical anchorage shall be prohibited. Where the pipe is slotted to accommodate webs of brackets or other connections, the integrity of the shell shall be restored by welding to ensure hooping action of the composite section.

**1915.4 Reinforcement.** Steel reinforcement shall be in the form of rods, structural shapes or pipe embedded in the concrete core in accordance with ACI 318 and AISC 360 with sufficient clearance to ensure the composite action of the section, but not nearer than 1 inch (25 mm) to the exterior steel shell. Structural shapes used as reinforcement shall be milled to ensure bearing on cap and base plates.

**1915.5 Fire-resistance-rating protection.** Steel columns shall be of such size or so protected as to develop the required fire-resistance ratings specified in Table 601. Where an outer steel shell is used to enclose the fire protective covering, the shell shall not be included in the calculations for strength of the column section. The minimum diameter of steel columns shall be 4 inches (102 mm)

except that in structures of Type V construction not exceeding three stories or 40 feet (12 192 mm) above grade plane, steel columns used in basements and as secondary steel members shall have a minimum diameter of 3 inches (76 mm).

**1915.5.1 Vent holes.** Four minimum ½ inch (12.7 mm) diameter holes top and bottom shall be placed opposite each other, two at the top and two at the bottom of the column. The two bottom holes shall be rotated 90° relative to the two top holes.

**1915.6 Approvals.** Details of column connections and splices shall be shop fabricated in accordance with ACI 318 and AISC 360. Concrete-filled steel columns shall be inspected by an approved agency pursuant to Chapter 17 of this code.

## SECTION BC 1916 STRUCTURAL INTEGRITY REQUIREMENTS

**1916.1 General.** Reinforced concrete structures shall meet all the requirements of Sections 1916.1 through 1916.3. Concrete slabs on metal deck shall be governed by the provisions of Chapter 22. Reinforcement provided for gravity, seismic and wind forces or for other purposes may be regarded as forming part of, or the whole of, these requirements. Reinforcing provided for one requirement may be counted towards the other requirements.

**1916.2 Continuity and ties.** The structural integrity requirements of ACI 318, Section 7.13 shall apply. In addition, the following requirements shall be met.

**1916.2.1 Slab reinforcement.** At all floor and roof levels, slabs shall have a mat of bottom reinforcement in two perpendicular (or roughly perpendicular) directions. Reinforcement in this bottom mat shall be made continuous with lap, mechanical or welded tension splices.

**1916.2.1.1 Bottom mat reinforcement.** In each direction, the bottom mat reinforcement shall be not less than, the steel required for temperature reinforcement. The bottom mat reinforcement shall be anchored at discontinuous edges within the column strip, reentrant corners, elevation changes and anywhere else the continuity of the reinforcing is interrupted.

**Exception:** Flat plate middle strip bottom mat reinforcing perpendicular to discontinuous slab edges. In addition, the main bottom mat reinforcement in one-way slabs shall be anchored at discontinuous edges.

**1916.2.2 Peripheral ties.** At each floor and roof level, reinforcement forming a continuous peripheral tie shall be provided. Peripheral ties shall be located within perimeter beams or walls, where they occur, or within 4 feet (1219 mm) of the edge of slab, where perimeter beams or walls do not occur. Continuous tie reinforcement shall be equal to half of the bottom reinforcement within the edge or edge strip for two-way slabs but not less than two bars.

**1916.2.3 Horizontal ties.** At each column, beam reinforcement or slab bottom reinforcement shall be provided



at each level that can develop a tension force equal to the maximum of Item 1 or 2:

1. Three times the load entering the column at that level, using a load combination of  $1.0 \times DL$  (self weight of structure only).
2. One and a half times the load entering the column at that level using the load combinations of  $(1.2 DL + 1.6 LL)$  or  $1.4 DL$ .
3. For transfer elements only, in lieu of Item 1 or 2, the horizontal reinforcement shall be anchored at all supports.

**1916.2.3.1 Bottom reinforcing.** This beam or slab bottom reinforcement shall be distributed around the column perimeter and shall be extended on all sides of the column into the adjacent slab for at least one-third of the span length. Where reinforcing bars cannot be extended beyond the column (e.g., at slab edges and openings), they shall be hooked or otherwise developed within the column.

**1916.2.4 Vertical ties.** Each column and each wall carrying vertical load shall be vertically tied continuously from its lowest to highest level. The vertical ties composed of vertical column reinforcement shall be capable of resisting a tensile force equal to the maximum design dead and live load received by the column or wall from any one story within four floors below.

**1916.3 Precast concrete general.** Precast concrete structural elements shall be reinforced to meet all of the requirements of this section. However, reinforcement provided for gravity, seismic and wind forces and for other purposes may be regarded as forming part of, or the whole of, these requirements. Reinforcing provided for one requirement may be counted towards the other requirements.

**1916.3.1 Continuity and ties.** The structural integrity requirements of ACI 318, Section 16.5, shall apply. In precast and composite structures, ties within precast structural elements shall be continuous and shall be anchored to the supporting structure. In addition to Sections 1916.2.2 and 1916.2.4, the following requirements shall be met.

**1916.3.1.1 End connections.** End connections of all precast slabs, beams and girders shall have an axial tension capacity equal to the larger of the vertical shear capacity of the connection at either end, or at least 2 percent of the maximum factored vertical dead and live load in the precast compression element, whichever is larger, but not less than 20 kips or 2,500 pounds per linear foot of slab (36.48 kN/m). Where more than one element frames in one direction, none of the elements or connections shall have an axial tension capacity of less than 1 percent of the column load but not less than 20 kips.

**1916.3.1.2 Side connections.** Side connections of all precast elements shall have an axial tension capacity not less than the steel required for temperature reinforcement of the larger element at either side.

**1916.3.1.3 Connection forces.** For design of the connections, the transverse shear force and the axial tensile force need not be considered to act simultaneously.

**1916.3.2 Joints.** Joints in precast structures shall not rely on friction due to gravity to transfer load.

**1916.3.3 Bearing.** The net bearing area shall not be less than 2 inches (51 mm) wide and 3 inches (76 mm) long in the direction of the member.

## SECTION BC 1917 PAVING

**1917.1 Definitions.** The following words and terms shall, for the purposes of this section, have the meanings shown herein.

**ASPHALT.** A dark brown to black bitumen pitch that melts readily and which appears in nature in asphalt beds or is produced as a by-product of the petroleum industry.

**ASPHALTIC CONCRETE or ASPHALT PAVING.** A mixture of liquid asphalt and graded aggregate used as a paving material.

**I-4 MIX.** A type of heavy duty asphaltic concrete mix containing 0.75 inch (19 mm) nominal maximum size aggregate with 25 to 50 percent $\pm$  of the aggregate capable of passing through a No. 8 sieve and in which all sand contained in the mix is crushed.

**RECLAIMED ASPHALT PAVEMENT.** Asphalt pavement that has been processed for reuse in asphaltic concrete.

**1917.2 Reclaimed asphalt pavement content in asphaltic concrete.** On and after January 1, 2015, asphaltic concrete, other than I-4 mix or other approved heavy duty asphaltic concrete mix, shall contain not less than 30 percent reclaimed asphalt pavement, as measured by weight. I-4 mix or other approved heavy duty asphaltic concrete mix shall contain not less than 10 percent reclaimed asphalt pavement, as measured by weight. Reclaimed asphalt paving used in asphaltic concrete shall comply with ASTM D 692 or ASTM 1073.

### Exceptions:

1. Asphaltic concrete used in a project where the content of asphaltic concrete is governed by a federal or state law, rule, regulation, guideline, or specification that requires a different composition.
2. Asphaltic concrete used for runways, taxiways, or other surfaces utilized by aircraft.
3. The commissioner may waive compliance with this section if the commissioner, after consulting with the commissioner of transportation and the owners or persons in charge of all asphalt plants located within the city, finds that a sufficient supply of reclaimed asphalt pavement is not available.

## CHAPTER 20

# ALUMINUM

### SECTION BC 2001 GENERAL

**2001.1 Scope.** This chapter shall govern the quality, design, fabrication and erection of aluminum.

### SECTION BC 2002 MATERIALS

**2002.1 General.** Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM unless otherwise restricted by this code. The nominal loads shall be the minimum design loads required by Chapter 16 of this code.

### SECTION BC 2003 ADDITIONAL REQUIREMENTS

**2003.1 Identification.** Aluminum for structural elements shall at all times in the fabricator's plant, be marked, segregated, or otherwise handled so that the separate alloys and tempers are positively identified, and after completion of fabrication shall be marked to identify the alloy and temper. Such markings shall be affixed to completed members and assemblies or to boxed or bundled shipments of multiple units prior to shipment from the fabricator's plant.

**2003.2 Quality control.** In addition to the requirements of Section 2002, the quality control of aluminum used for structural purposes shall comply with Sections 2003.2.1 and 2003.2.2.

**2003.2.1 Reference.** Welding operations shall be subjected to the special inspections as required by Chapter 17 of this code.

**2003.2.2 Welding operations.** Welding operations performed on aluminum used for structural purposes shall comply with the following:

1. The provisions of AWS D1.2.
2. Welding work shall be performed only by persons who have obtained a license from the commissioner. Where manual welding work on structural members is not performed in the City of New York, welds shall be made by welders certified by the American Welding Society in accordance with AWS D1.2.



## CHAPTER 21

# MASONRY

### SECTION BC 2101 GENERAL

**2101.1 Scope.** This chapter shall govern the materials, design, construction and quality of masonry.

**2101.2 Design methods.** Masonry shall comply with the provisions of one of the following design methods in this chapter as well as the requirements of Sections 2101 through 2104. Masonry designed by the allowable stress design provisions of Section 2101.2.1, the strength design provisions of Section 2101.2.2 or the prestressed masonry provisions of Section 2101.2.3 shall comply with Section 2105 for quality assurance.

**2101.2.1 Allowable stress design.** Masonry designed by the allowable stress design method shall comply with the provisions of Sections 2106 and 2107.

**2101.2.2 Strength design.** Masonry designed by the strength design method shall comply with the provisions of Sections 2106 and 2108, except that autoclaved aerated concrete (AAC) masonry shall comply with the provisions of Section 2106 of this code, and Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.

**2101.2.3 Prestressed masonry.** Prestressed masonry shall be designed in accordance with Chapters 1 and 4 of TMS 402/ACI 530/ASCE 5 and Section 2106 of this code. Special inspection during construction shall be provided as set forth in Section 1704.5.

**2101.2.4 Empirical design.** Masonry designed by the empirical design method shall comply with the provisions of Sections 2106 and 2109 of this code or Chapter 5 of TMS 402/ACI 530/ASCE 5.

**2101.2.5 Glass masonry.** Glass masonry shall comply with the provisions of Section 2110 of this code or with the requirements of Chapter 7 of TMS 402/ACI 530/ASCE 5.

**2101.2.6 Masonry veneer.** Masonry veneer shall comply with the provisions of Chapter 14 of this code or Chapter 6 of TMS 402/ACI 530/ASCE 5.

**2101.3 Construction documents.** The construction documents shall show all of the items required by this code including the following:

1. Specified size, grade, type and location of reinforcement, anchors and wall ties.
2. Reinforcing bars to be welded and welding procedure.
3. Size and location of structural elements.
4. Provisions for dimensional changes resulting from elastic deformation, creep, shrinkage, temperature and moisture.
5. Specified compressive strength of masonry at stated ages or stages of construction for which masonry is

designed, except where specifically exempted by this code.

6. Details of anchorage of masonry to structural members, including the type, size and location of connectors.

7. The minimum level of testing and inspection as defined in Chapter 17, or an itemized testing and inspection program that meets or exceeds the requirements of Chapter 17.

**2101.3.1 Fireplace drawings.** The construction documents shall describe in sufficient detail the location, size and construction of masonry fireplaces. The thickness and characteristics of materials and the clearances from walls, partitions and ceilings shall be clearly indicated. The masonry fireplace shall comply with the provisions of Section 2111.

### SECTION BC 2102 DEFINITIONS AND NOTATIONS

**2102.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**AAC MASONRY.** Masonry made of autoclaved aerated concrete (AAC) units, manufactured without internal reinforcement and bonded together using thin- or thick-bed mortar.

**ANCHOR.** Metal rod, wire or strap that secures masonry to its structural support.

**ARCHITECTURAL TERRA COTTA.** Plain or ornamental hard-burned modified clay units, larger in size than brick, with glazed or unglazed ceramic finish.

**AREA.**

**Bedded.** The area of the surface of a masonry unit that is in contact with mortar in the plane of the joint.

**Gross cross-sectional.** The area delineated by the out-to-out specified dimensions of masonry in the plane under consideration.

**Net cross-sectional.** The area of masonry units, grout and mortar crossed by the plane under consideration based on out-to-out specified dimensions.

**AUTOCLAVED AERATED CONCRETE (AAC).** Low-density cementitious product of calcium silicate hydrates, whose material specifications are defined in ASTM C 1386.

**BED JOINT.** The horizontal layer of mortar on which a masonry unit is laid.

**BOND BEAM.** A horizontal grouted element within masonry in which reinforcement is embedded.

**BOND REINFORCING.** The adhesion between steel reinforcement and mortar or grout.



**BRICK.**

**Calcium silicate (sand lime brick).** A masonry unit made of sand and lime.

**Clay or shale.** A masonry unit made of clay or shale, usually formed into a rectangular prism while in the plastic state and burned or fired in a kiln.

**Concrete.** A masonry unit having the approximate shape of a rectangular prism and composed of inert aggregate particles embedded in a hardened cementitious matrix.

**BUTTRESS.** A projecting part of a masonry wall built integrally therewith to provide lateral stability.

**CAST STONE.** A building stone manufactured from portland cement concrete precast and used as a trim, veneer or facing on or in buildings or structures.

**CELL.** A void space having a gross cross-sectional area greater than 1½ square inches (967 mm²).

**CHIMNEY.** A primarily vertical enclosure containing one or more flues used to remove hot gases from burning fuel, refuse, or from industrial processes to the outside atmosphere.

**CHIMNEY TYPES.**

**High-heat appliance type.** An approved chimney for removing the products of combustion from fuel-burning, high-heat appliances producing combustion gases in excess of 2,000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.3).

**Low-heat appliance type.** An approved chimney for removing the products of combustion from fuel-burning, low-heat appliances producing combustion gases not in excess of 1,000°F (538°C) under normal operating conditions, but capable of producing combustion gases of 1,400°F (760°C) during intermittent forces firing for periods up to 1 hour. Temperatures shall be measured at the appliance flue outlet.

**Masonry type.** A field-constructed chimney of solid masonry units or stones.

**Medium-heat appliance type.** An approved chimney for removing the products of combustion from fuel-burning, medium-heat appliances producing combustion gases between 1,000°F (538°C) and 2,000°F (1093°C) measured at the appliance flue outlet (see Section 2113.11.2).

**CLEANOUT.** An opening to the bottom of a grout space of sufficient size and spacing to allow the removal of debris.

**COLLAR JOINT.** Vertical longitudinal joint between wythes of masonry or between masonry and backup construction that is permitted to be filled with mortar or grout.

**COMPRESSIVE STRENGTH OF MASONRY.** Maximum compressive force resisted per unit of net cross-sectional area of masonry, determined by the testing of masonry prisms or a function of individual masonry units, mortar and grout.

**CONNECTOR.** A mechanical device for securing two or more pieces, parts or members together, including anchors, wall ties and fasteners.

**COVER.** Distance between surface of reinforcing bar and edge of member.

**DECORATIVE SHROUD.** A listed partial noncombustible enclosure for aesthetic purposes that is installed at the termination of a venting system that surrounds or conceals the chimney or vent cap.

**DIMENSIONS.**

**Actual.** The measured dimension of a masonry unit or element.

**Nominal.** The specified dimension plus an allowance for the joints with which the units are to be laid. Thickness is given first, followed by height and then length.

**Specified.** The dimensions specified for the manufacture or construction of masonry, masonry units, joints or any other component of a structure.

**FIREPLACE.** A hearth and fire chamber or similar prepared place in which a fire may be made and which is built in conjunction with a chimney.

**FIREPLACE THROAT.** The opening between the top of the firebox and the smoke chamber.

**FLUE.** A passageway within a chimney or vent through which gaseous combustion products pass.

**FLUE, APPLIANCE.** The passage(s) within an appliance through which combustion products pass from the combustion chamber of the appliance to the draft hood inlet opening on an appliance equipped with a draft hood or to the outlet of the appliance on an appliance not equipped with a draft hood.

**FLUE GASES.** Products of combustion plus excess air in appliance flues or heat exchangers.

**FLUE LINER (LINING).** A system or material used to form the inside surface of a flue in a chimney or vent, for the purpose of protecting the surrounding structure from the effects of combustion products and for conveying combustion products without leakage into the atmosphere.

**FOUNDATION PIER.** An isolated vertical foundation member whose horizontal dimension measured at right angles to its thickness does not exceed three times its thickness and whose height is equal to or less than four times its thickness.

**GROUT.** A plastic mixture of cementitious materials, aggregates, and water, with or without admixtures, initially produced to pouring consistency without segregation of the constituents during placement, or the equivalent of such mixtures, conforming to ASTM C 476.

**GROUTED MASONRY.**

**Grouted hollow-unit masonry.** That form of grouted masonry construction in which certain designated cells of hollow units are continuously filled with grout.

**Grouted multi-wythe masonry.** That form of grouted masonry construction in which the space between the wythes is solidly or periodically filled with grout.

**HEAD JOINT.** Vertical mortar joint placed between masonry units within the wythe at the time the masonry units are laid.

**HEIGHT, WALLS.** The vertical distance from the foundation wall or other immediate support of such wall to the top of the wall.

**MASONRY.** A built-up construction or combination of building units or materials of clay, shale, concrete, glass, gypsum, stone or other approved units bonded together with or without mortar or grout or other accepted method of joining.

**Ashlar masonry.** Masonry composed of various sized rectangular units having sawed, dressed or squared bed surfaces, properly bonded and laid in mortar.

**Coursed ashlar.** Ashlar masonry laid in courses of stone of equal height for each course, although different courses shall be permitted to be of varying height.

**Glass unit masonry.** Masonry composed of glass units bonded by mortar.

**Plain masonry.** Masonry in which the tensile resistance of the masonry is taken into consideration and the effects of stresses in reinforcement are neglected.

**Random ashlar.** Ashlar masonry laid in courses of stone set without continuous joints and laid up without drawn patterns. When composed of material cut into modular heights, discontinuous but aligned horizontal joints are discernible.

**Reinforced masonry.** Masonry construction in which reinforcement acting in conjunction with the masonry is used to resist forces.

**Solid masonry.** Masonry consisting of solid masonry units laid contiguously with the joints between the units filled with mortar.

**Unreinforced (plain) masonry.** Masonry in which the tensile resistance of masonry is taken into consideration and the resistance of the reinforcing steel, if present, is neglected.

**MASONRY UNIT.** Brick, tile, stone, glass block or concrete block conforming to the requirements specified in Section 2103.

**Clay.** A building unit larger in size than a brick, composed of burned clay, shale, fired clay or mixtures thereof.

**Concrete.** A building unit or block larger in size than 12 inches by 4 inches by 4 inches (305 mm by 102 mm by 102 mm) made of cement and suitable aggregates.

**Hollow.** A masonry unit whose net cross-sectional area in any plane parallel to the load-bearing surface is less than 75 percent of its gross cross-sectional area measured in the same plane.

**Solid.** A masonry unit whose net cross-sectional area in every plane parallel to the load-bearing surface is 75 percent or more of its gross cross-sectional area measured in the same plane.

**MORTAR.** A plastic mixture of approved cementitious materials, fine aggregates and water used to bond masonry or other structural units.

**MORTAR, SURFACE-BONDING.** A mixture to bond concrete masonry units that contains hydraulic cement, glass fiber reinforcement with or without inorganic fillers or organic modifiers and water.

**PRESTRESSED MASONRY.** Masonry in which internal stresses have been introduced to counteract potential tensile stresses in masonry resulting from applied loads.

**PRISM.** An assemblage of masonry units and mortar with or without grout used as a test specimen for determining properties of the masonry.

**RUBBLE MASONRY.** Masonry composed of roughly shaped stones.

**Coursed rubble.** Masonry composed of roughly shaped stones fitting approximately on level beds and well bonded.

**Random rubble.** Masonry composed of roughly shaped stones laid without regularity of coursing but well-bonded and fitted together to form well-divided joints.

**Rough or ordinary rubble.** Masonry composed of unsquared field stones laid without regularity of coursing but well-bonded.

**RUNNING BOND.** The placement of masonry units such that head joints in successive courses are horizontally offset at least one-quarter the unit length.

**SHEAR WALL.**

**Detailed plain masonry shear wall.** A masonry shear wall designed to resist lateral forces neglecting stresses in reinforcement, and designed in accordance with Section 2106.1.

**Intermediate reinforced masonry shear wall.** A masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section 2106.1.

**Ordinary plain masonry shear wall.** A masonry shear wall designed to resist lateral forces neglecting stresses in reinforcement, and designed in accordance with Section 2106.1.

**Prestressed masonry shear wall.** A prestressed masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section 2106.1.1.1.

**Ordinary reinforced masonry shear wall.** A masonry shear wall designed to resist lateral forces considering stresses in reinforcement, and designed in accordance with Section 2106.1.

**SHELL.** The outer portion of a hollow masonry unit as placed in masonry.

**SPECIFIED.** Required by construction documents.

**SPECIFIED COMPRESSIVE STRENGTH OF MASONRY,  $f'_c$ .** Minimum compressive strength, expressed as force per unit of net cross-sectional area,

required of the masonry used in construction by the construction documents, and upon which the project design is based. Whenever the quantity  $f'_c$  is under the radical sign, the square root of numerical value only is intended and the result has units of pounds per square inch (psi) (Mpa).

**STACK BOND.** The placement of masonry units in a bond pattern is such that head joints in successive courses are vertically aligned. For the purpose of this code, requirements for stack bond shall apply to masonry laid in other than running bond.

**STONE MASONRY.** Masonry composed of field, quarried or cast stone units bonded by mortar.

**Ashlar stone masonry.** Stone masonry composed of rectangular units having sawed, dressed or squared bed surfaces and bonded by mortar.

**Rubble stone masonry.** Stone masonry composed of irregular-shaped units bonded by mortar.

## STRENGTH.

**Design strength.** Nominal strength multiplied by a strength reduction factor.

**Nominal strength.** Strength of a member or cross section calculated in accordance with these provisions before application of any strength-reduction factors.

**Required strength.** Strength of a member or cross section required to resist factored loads.

**THIN-BED MORTAR.** Mortar for use in construction of AAC unit masonry with joints 0.06 inch (1.5 mm) or less.

**TIE, LATERAL.** Loop of reinforcing bar or wire enclosing longitudinal reinforcement.

**TIE, WALL.** A connector that connects wythes of masonry walls together.

**TILE.** A ceramic surface unit, usually relatively thin in relation to facial area, made from clay or a mixture of clay or other ceramic materials, called the body of the tile, having either a "glazed" or "unglazed" face and fired above red heat in the course of manufacture to a temperature sufficiently high enough to produce specific physical properties and characteristics.

**TILE, STRUCTURAL CLAY.** A hollow masonry unit composed of burned clay, shale, fire clay or mixture thereof, and having parallel cells.

**WALL.** A vertical element with a horizontal length-to-thickness ratio greater than three, used to enclose space.

**Cavity wall.** A wall built of masonry units or of concrete, or a combination of these materials, arranged to provide an airspace within the wall, and in which the inner and outer parts of the wall are tied together with metal ties.

**Composite wall.** A wall built of a combination of two or more masonry units bonded together, one forming the backup and the other forming the facing elements.

**Dry-stacked, surface-bonded wall.** A wall built of concrete masonry units where the units are stacked dry, without mortar on the bed or head joints, and where both sides of the wall are coated with a surface-bonding mortar.

**Masonry-bonded hollow wall.** A wall built of masonry units so arranged as to provide an airspace within the wall, and in which the facing and backing of the wall are bonded together with masonry units.

**Parapet wall.** The part of any wall entirely above the roof line.

**WEB.** An interior solid portion of a hollow masonry unit as placed in masonry.

**WYTHE.** Each continuous, vertical section of a wall, one masonry unit in thickness.

## NOTATIONS.

$d_b$	= Diameter of reinforcement, inches (mm).	
$F_s$	= Allowable tensile or compressive stress in reinforcement, psi (MPa).	←
$f_r$	= Modulus of rupture, psi (MPa).	
$f'_{AAC}$	= Specified compressive strength of AAC masonry, the minimum compressive strength for a class of AAC masonry as specified in ASTM C 1386, psi (MPa).	←
$f'_m$	= Specified compressive strength of masonry at age of 28 days, psi (MPa).	←
$f'_{mi}$	= Specified compressive strength of masonry at the time of prestress transfer, psi (MPa).	←
$K$	= The lesser of the masonry cover, clear spacing between adjacent reinforcement, or five times $d_b$ , inches (mm).	
$L_s$	= Distance between supports, inches (mm).	←
$l_d$	= Required development length or lap length of reinforcement, inches (mm).	←
$P$	= The applied load at failure, pounds (N).	
$S_t$	= Thickness of the test specimen measured parallel to the direction of load, inches (mm).	
$S_w$	= Width of the test specimen measured parallel to the loading cylinder, inches (mm).	

## SECTION BC 2103 MASONRY CONSTRUCTION MATERIALS

**2103.1 Concrete masonry units.** Concrete masonry units shall conform to the following standards: ASTM C 55 for concrete brick; ASTM C 73 for calcium silicate face brick; ASTM C 90 for load-bearing concrete masonry units; ASTM C 129 for nonload-bearing concrete masonry units or ASTM C 744 for prefaced concrete and calcium silicate masonry units. NYC  
NYC

**2103.2 Clay or shale masonry units.** Clay or shale masonry units shall conform to the following standards: ASTM C 34 for structural clay load-bearing wall tile; ASTM C 56 for structural clay nonload-bearing wall tile; ASTM C 62 for building brick (solid masonry units made from clay or shale); ASTM C 1088 for solid units of thin veneer brick; ASTM C 126 for ceramic-glazed structural clay facing tile, facing brick and solid masonry units; ASTM C 212 for structural clay facing tile; ASTM C 216 for facing brick (solid

NYC masonry units made from clay or shale); ASTM C 652 for hollow brick (hollow masonry units made from clay or shale) and ASTM C 73 for calcium silicate face brick or ASTM C 1405 for glazed brick (single-fired solid brick units).

**Exception:** Structural clay tile for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet the compressive strength specifications. The fire-resistance rating shall be determined in accordance with ASTM E 119 or UL 263 and shall comply with the requirements of Table 602.

**2103.3 AAC masonry.** AAC masonry units shall conform to ASTM C 1386 for the strength class specified.

**2103.4 Stone masonry units.** Stone masonry units shall conform to the following standards: ASTM C 503 for marble building stone (exterior); ASTM C 568 for limestone building stone; ASTM C 615 for granite building stone; ASTM C 616 for sandstone building stone or ASTM C 629 for slate building stone.

**2103.5 Ceramic tile.** Ceramic tile shall be as defined in, and shall conform to the requirements of, ANSI A137.1.

**2103.6 Glass unit masonry.** Hollow glass units shall be partially evacuated and have a minimum average glass face thickness of  $\frac{3}{16}$  inch (4.8 mm). Solid glass-block units shall be provided when required. The surfaces of units intended to be in contact with mortar shall be treated with a polyvinyl butyral coating or latex-based paint. Reclaimed units shall not be used.

**2103.7 Second-hand units.** Second-hand masonry units shall not be reused unless they conform to the requirements of new units. The units shall be of whole, sound materials and free from cracks and other defects that will interfere with proper laying or use. Old mortar shall be cleaned from the unit before reuse.

NYC **Exception:** Second-hand masonry units need not conform to the requirements for new units when their reuse is to comply with historic restoration standards or requirements of the New York City Landmarks Preservation Commission or the New York State Historic Preservation Office.

NYC **2103.8 Mortar.** Mortar for use in masonry construction shall conform to ASTM C 270 and Articles 2.1 and 2.6A of TMS 602/ACI 530/ASCE 6, except for mortars listed in Sections 2103.9, 2103.10, and 2103.11 of this code. Type S or N mortar conforming to ASTM C 270 shall be used for glass unit masonry.

**2103.9 Surface-bonding mortar.** Surface-bonding mortar shall comply with ASTM C 887. Surface bonding of concrete masonry units shall comply with ASTM C 946.

**2103.10 Mortars for ceramic wall and floor tile.** Portland cement mortars for installing ceramic wall and floor tile shall comply with ANSI A108.1A and ANSI A108.1B and be of the compositions indicated in Table 2103.10.

**TABLE 2103.10  
CERAMIC TILE MORTAR COMPOSITIONS**

LOCATION	MORTAR	COMPOSITION
Walls	Scratchcoat	1 cement; $\frac{1}{5}$ hydrated lime; 4 dry or 5 damp sand
	Setting bed and leveling coat	1 cement; $\frac{1}{2}$ hydrated lime; 5 damp sand to 1 cement 1 hydrated lime, 7 damp sand
Floors	Setting bed	1 cement; $\frac{1}{10}$ hydrated lime; 5 dry or 6 damp sand; or 1 cement; 5 dry or 6 damp sand
Ceilings	Scratchcoat and sand bed	1 cement; $\frac{1}{2}$ hydrated lime; $2\frac{1}{2}$ dry sand or 3 damp sand

**2103.10.1 Dry-set Portland cement mortars.** Premixed prepared Portland cement mortars, which require only the addition of water and are used in the installation of ceramic tile, shall comply with ANSI A118.1. The shear bond strength for tile set in such mortar shall be as required in accordance with ANSI A118.1. Tile set in dry-set Portland cement mortar shall be installed in accordance with ANSI A108.5.

**2103.10.2 Latex-modified Portland cement mortar.** Latex-modified Portland cement thin-set mortars in which latex is added to dry-set mortar as a replacement for all or part of the gauging water that are used for the installation of ceramic tile shall comply with ANSI A118.4. Tile set in latex-modified Portland cement shall be installed in accordance with ANSI A108.5.

**2103.10.3 Epoxy mortar.** Ceramic tile set and grouted with chemical-resistant epoxy shall comply with ANSI A118.3. Tile set and grouted with epoxy shall be installed in accordance with ANSI A 108.6.

**2103.10.4 Furan mortar and grout.** Chemical-resistant furan mortar and grout that are used to install ceramic tile shall comply with ANSI A118.5. Tile set and grouted with furan shall be installed in accordance with ANSI A108.8.

**2103.10.5 Modified epoxy-emulsion mortar and grout.** Modified epoxy-emulsion mortar and grout that are used to install ceramic tile shall comply with ANSI A118.8. Tile set and grouted with modified epoxy-emulsion mortar and grout shall be installed in accordance with ANSI A108.9.

**2103.10.6 Organic adhesives.** Water-resistant organic adhesives used for the installation of ceramic tile shall comply with ANSI A136.1. The shear bond strength after water immersion shall not be less than 40 psi (275 kPa) for Type I adhesive, and not less than 20 psi (138 kPa) for Type II adhesive, when tested in accordance with ANSI A136.1. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4.

**2103.10.7 Portland cement grouts.** Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A108.10.



**2103.11 Mortar for AAC masonry.** Thin-bed mortar for AAC masonry shall comply with Article 2.1C.1 of TMS 602/ACI 530.1/ASCE 6. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1C.2 of TMS 602/ACI 530.1/ASCE 6.

**2103.12 Grout.** Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

**2103.13 Metal reinforcement and accessories.** Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602/ACI 530.1/ASCE 6. Where unidentified reinforcement is approved for use, not less than three tension and three bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

## SECTION BC 2104 CONSTRUCTION

**2104.1 Masonry construction.** Masonry construction shall comply with the requirements of Sections 2104.1.1 through 2104.5 and with TMS 602/ACI 530.1/ASCE 6.

**2104.1.1 Tolerances.** Masonry, except masonry veneer, shall be constructed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6.

**2104.1.2 Placing mortar and units.** Placement of mortar, grout and of clay, concrete, glass, and AAC masonry units shall comply with TMS 602/ACI 530.1/ASCE 6.

**2104.1.3 Installation of wall ties.** Installation of wall ties shall comply with TMS 602/ACI 530.1/ASCE 6.

**2104.1.4 Chases and recesses.** Chases and recesses shall be constructed as masonry units are laid. Masonry directly above chases or recesses wider than 12 inches (305 mm) shall be supported on lintels.

**2104.1.5 Lintels.** The design of lintels shall be in accordance with the masonry design provisions of either Section 2107 or 2108. Minimum length of end support shall be 4 inches (102 mm).

**2104.1.6 Support on wood.** Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304.12.

**2104.2 Corbeled masonry.** Corbeled masonry shall comply with the requirements of Section 1.12 of TMS 402/ACI 530/ASCE 5.

**2104.2.1 Molded cornices.** Unless structural support and anchorage are provided to resist the overturning moment, the center of gravity of projecting masonry or molded cornices shall lie within the middle one-third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of approved noncombustible material anchored in a manner approved by the commissioner.

**2104.3 Cold weather construction.** The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8C shall be implemented when either the ambient temperature falls below 40°F (4°C) or the temperature of masonry units is below 40°F (4°C).

**2104.3.1 Preparation.** No salt or other chemicals for the purpose of lowering the freezing temperature of water shall be permitted in the mortar mix.

**2104.4 Hot weather construction.** The hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6 Article 1.8D shall be implemented when the temperature exceeds 100°F (37.8°C), or 90°F (32.2°C) with a wind-velocity greater than 8 mph (12.9 km/hr).

**2104.5 Wetting of brick.** Brick (clay or shale) at the time of laying shall require wetting if the unit's initial rate of water absorption exceeds 21.42 grams per 30 square inches (19 355 mm<sup>2</sup>) per minute or 0.025 ounce psi (1 g/645 mm<sup>2</sup>), as determined by ASTM C 67.

**2104.6 Masonry construction bracing.** In accordance with TMS 602/ACI 530.1/ASCE 6 Section 3.3E, the contractor shall design, provide, and install bracing that will assure stability of all masonry during construction. The contractor shall keep a bracing plan on site during all masonry construction. Bracing plans shall consider wind loads, initial and intermediate masonry strengths, and the contractor's ability to evacuate the site. Construction bracing for walls within a distance less than their height from adjoining properties or other unprotected and uncontrolled areas shall be designed for code prescribed wind loads and the bracing plan shall be signed and sealed by a licensed professional engineer. Construction bracing for walls may be designed using reduced loading in accordance with Section 1618. Such reduced loading shall only be permitted when an action plan meeting the requirements of Section 1618.3 is provided and maintained at the site.

**2104.7 Conduits, pipes, and sleeves in masonry.** Conduits, pipes and sleeves of any material not harmful to masonry are permitted to be installed in the masonry with approval of the registered design professional of record.

**2104.8 Parapet walls.** At a minimum, parapet walls shall meet the following requirements:

**2104.8.1 Parapet wall construction.** All cells in the hollow masonry units and all joints in solid, cavity, or masonry-bonded hollow wall construction shall be filled solid. All corners of masonry parapet walls shall be reinforced with joint reinforcement or its equivalent at vertical intervals not greater than 12 inches (305 mm). Such reinforcement shall extend around the corner for at least 4 feet (1219 mm) in both directions, and splices shall be lapped at least 6 inches (152 mm).

**2104.8.2 Parapet anchorage.** Parapets of buildings taller than 35 feet (10 668 mm) shall be reinforced vertically and shall be anchored to the roof and floors that provide lateral support for the wall in accordance with Section 1604.8.2.

**2104.9 Floor and roof anchorage.**

**2104.9.1 Bearing details.** Concentrated loads shall be supported upon construction of solid masonry, concrete, or masonry of hollow units with cells filled with mortar, grout, or concrete. In addition, construction supporting concentrated loads shall be of sufficient height to distribute safely the loads to the wall or column, or other adequate provisions shall be made to distribute the loads.

**2104.9.1.1 Joists.** Solid construction for support under joists shall be at least 2<sup>1</sup>/<sub>4</sub> inches (57 mm) in height, and joists supported on such construction shall extend into the masonry at least 3 inches (76 mm).

**2104.9.1.2 Beams.** Solid construction for support under beams, girders, or other concentrated loads shall be at least 4 inches (102 mm) in height, and the bearing of beams shall extend into the masonry at least 4 inches (102 mm).

**2104.9.1.3 Isolated piers.** Isolated masonry piers shall be bonded as required for solid walls of the same thickness and shall be provided with adequate means for distributing the load at the top of the pier.

## 2104.10 Walls adjoining structural framing.

**2104.10.1 Use of existing walls.** An existing masonry wall may be used in the alteration or extension of a building provided that it meets the requirements of this code.

**2104.10.2 Walls of insufficient thickness.** Existing walls of masonry units that are structurally sound, but that are of insufficient thickness when increased in height, may be strengthened by an addition of similar masonry units laid in Type M or S mortar. The foundations and lateral support shall be equivalent to those required for newly constructed walls under similar conditions. All such linings shall be thoroughly bonded into existing masonry by toothings to assure combined action of wall and lining. Toothings shall be distributed uniformly throughout the wall, and shall aggregate in vertical cross-sectional area at least 15 percent of the total surface area of the lining. Stresses in the masonry under the new conditions shall not exceed the allowable stresses.

**2104.11 Isolation joints.** All nonparticipating masonry walls and veneers shall be constructed with adequate depth and width of isolation joints to prevent masonry distress induced by deflections, drifts, shortening, expansion, or other similar movements in the plane of the wall.

**2104.12 Substitution.** Mortar shall not be substituted for grout where grout is specified on the construction documents.

## SECTION BC 2105 QUALITY ASSURANCE

**2105.1 General.** A quality assurance program shall be used to ensure that the constructed masonry is in compliance with the construction documents. The quality assurance program shall comply with the inspection and testing requirements of Chapter 17.

### 2105.2 Acceptance relative to strength requirements.

**2105.2.1 Compliance with  $f'_m$  and  $f'_{AAC}$ .** Compressive strength of masonry shall be considered satisfactory if the compressive strength of each masonry wythe and grouted collar joint equals or exceeds the value of  $f'_m$  for clay and concrete masonry and  $f'_{AAC}$  for AAC masonry. For partially grouted clay and concrete masonry, the compressive strength of both the grouted and ungrouted masonry shall equal or exceed the applicable  $f'_m$ . At the time of prestress,

the compressive strength of the masonry shall equal or exceed  $f'_{mi}$ , which shall be less than or equal to  $f'_m$ .

**2105.2.2 Determination of compressive strength.** The compressive strength for each wythe shall be determined by the unit strength method or by the prism test method as specified herein.

#### 2105.2.2.1 Unit strength method.

**2105.2.2.1.1 Clay masonry.** The compressive strength of masonry shall be determined based on the strength of the units and the type of mortar specified using Table 2105.2.2.1.1, provided:

1. Units are sampled and tested in accordance with ASTM C 67 to verify compliance with ASTM C 62, ASTM C 216 or ASTM C 652.
2. Thickness of bed joints does not exceed <sup>5</sup>/<sub>8</sub> inch (15.9 mm).
3. For grouted masonry, the grout meets one of the following requirements:
  - 3.1. Grout conforms to Article 2.2 of TMS 602/ACI 530.1/ASCE 6.
  - 3.2. Minimum grout compressive strength equals or exceeds  $f'_m$  but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

TABLE 2105.2.2.1.1  
COMPRESSIVE STRENGTH OF CLAY MASONRY

NET AREA COMPRESSIVE STRENGTH OF CLAY MASONRY UNITS (psi)		NET AREA COMPRESSIVE STRENGTH OF MASONRY (psi)
Type M or S mortar	Type N mortar	
1,700	2,100	1,000
3,350	4,150	1,500
4,950	6,200	2,000
6,600	8,250	2,500
8,250	10,300	3,000
9,900	—	3,500
13,200	—	4,000

For SI: 1 pound per square inch = 0.00689 MPa.

**2105.2.2.1.2 Concrete masonry.** The compressive strength of masonry shall be determined based on the strength of the unit and type of mortar specified using Table 2105.2.2.1.2, provided:

1. Units conform to ASTM C 55 or ASTM C 90 and are sampled and tested in accordance with ASTM C 140.
2. Thickness of bed joints does not exceed <sup>5</sup>/<sub>8</sub> inch (15.9 mm).
3. For grouted masonry, the grout meets one of the following requirements:
  - 3.1. Grout conforms to Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

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3.2. Minimum grout compressive strength equals  $f'_m$  but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

**TABLE 2105.2.2.1.2  
COMPRESSIVE STRENGTH OF CONCRETE MASONRY**

NET AREA COMPRESSIVE STRENGTH OF CONCRETE MASONRY UNITS (psi)		NET AREA COMPRESSIVE STRENGTH OF MASONRY (psi) <sup>a</sup>
Type M or S mortar	Type N mortar	
1,250	1,300	1,000
1,900	2,150	1,500
2,800	3,050	2,000
3,750	4,050	2,500
4,800	5,250	3,000

For SI: 1 inch = 25.4 mm, 1 pound per square inch = 0.00689 mPa.

a. For units less than 4 inches in height, 85 percent of the values listed.

**2105.2.2.1.3 AAC masonry.** The compressive strength of AAC masonry shall be based on the strength of the AAC masonry unit only and the following shall be met:

1. Units conform to ASTM C 1386.
2. Thickness of bed joints does not exceed  $\frac{1}{8}$  inch (3.2 mm).
3. For grouted masonry, the grout meets one of the following requirements:
  - 3.1. Grout conforms to Article 2.2 of TMS 602/ACI 530. 1/ASCE 6.
  - 3.2. Minimum grout compressive strength equals or exceeds  $f'_{AAC}$  but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.

#### 2105.2.2.2 Prism test method.

**2105.2.2.2.1 General.** The compressive strength of masonry shall be determined by the prism test method:

1. Where specified in the construction documents.
2. Where masonry does not meet the requirements for application of the unit strength method in Section 2105.2.2.1.

**2105.2.2.2.2 Number of prisms per test.** A prism test shall consist of three prisms constructed and tested in accordance with ASTM C 1314.

**2105.3 Testing prisms from constructed masonry.** When approved by the commissioner acceptance of masonry that does not meet the requirements of Section 2105.2.2.1 or 2105.2.2.2 shall be permitted to be based on tests of prisms cut from the masonry construction in accordance with Sections 2105.3.1, 2105.3.2 and 2105.3.3.

**2105.3.1 Prism sampling and removal.** A set of three masonry prisms that are at least 28 days old shall be saw

cut from the masonry for each 5,000 square feet (465 m<sup>2</sup>) of the wall area that is in question but not less than one set of three masonry prisms for the project. The length, width and height dimensions of the prisms shall comply with the requirements of ASTM C 1314. Transporting, preparation and testing of prisms shall be in accordance with ASTM C 1314.

**2105.3.2 Compressive strength calculations.** The compressive strength of prisms shall be the value calculated in accordance ASTM C 1314, except that the net cross-sectional area of the prism shall be based on the net mortar bedded area.

**2105.3.3 Compliance.** Compliance with the requirement for the specified compressive strength of masonry,  $f'_m$ , shall be considered satisfied provided the modified compressive strength equals or exceeds the specified  $f'_m$ . Additional testing of specimens cut from locations in question shall be permitted.

**2105.4 Submittals.** Submittals required by TMS 602/ACI 530.1/ASCE 6 Section 1.5 shall be sent to the applicant of record for review prior to use of the materials or methods of construction. In addition the contractor shall submit a Material Storage and Protection Plan.

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## SECTION BC 2106 SEISMIC DESIGN

**2106.1 Seismic design requirements for masonry.** Masonry structures and components shall comply with the requirements in Section 1.17† of TMS 402/ACI 530/ASCE 5 depending on the structure's seismic design category as determined in Section 1613 of this code. All masonry walls, unless isolated on three edges from in-plane motion of the basic structural systems, shall be considered to be part of the seismic-force-resisting system.

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**2106.1.1 Non-participating masonry walls.** Masonry walls that are not part of the lateral-force-resisting‡ system shall be isolated from the structure so that the vertical and lateral forces are not imparted to these elements. Isolation joints and connectors between these elements and the structure shall be designed to accommodate the design story drift.

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## SECTION BC 2107 ALLOWABLE STRESS DESIGN

**2107.1 General.** The design of masonry structures using allowable stress design shall comply with Section 2106 and the requirements of Chapters 1 and 2, except Section 2.1.2.1 and 2.1.3.3 of TMS 402/ACI 530/ASCE 5. The text of TMS 402/ACI 530/ASCE 5 shall be modified by Sections 2107.2 through 2107.5 of this code.

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**2107.2 TMS 402/ACI 530/ASCE 5, Section 2.1.2, load combinations.** Delete Section 2.1.2.1.

**2107.3 TMS 402/ACI 530/ASCE 5, Section 2.1.9.7.1.1, lap splices.** Modify Section 2.1.9.7.1.1 as follows:

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2.1.7.1.1 The minimum length of lap splices for reinforcing bars in tension or compression,  $l_d$ , shall be

$$l_d = 0.002d_b f_s \quad (\text{Equation 21-1})$$

For SI:  $l_d = 0.29d_b f_s$

but not less than 12 inches (305 mm). In no case shall the length of the lapped splice be less than 40 bar diameters.

where:

$d_b$  = Diameter of reinforcement, inches (mm).

$f_s$  = Computed stress in reinforcement due to design loads, psi (MPa).

In regions of moment where the design tensile stresses in the reinforcement are greater than 80 percent of the allowable steel tension stress,  $F_s$ , the lap length of splices shall be increased not less than 50 percent of the minimum required length. Other equivalent means of stress transfer to accomplish the same 50 percent increase shall be permitted. Where epoxy coated bars are used, lap length shall be increased by 50 percent.

**2107.4 TMS 402/ACI 530/ASCE 5, Section 2.1.9.7, splices of reinforcement.** Modify Section 2.1.9.7 as follows:

2.1.9.7 Splices of reinforcement. Lap splices, welded splices or mechanical splices are permitted in accordance with the provisions of this section. All welding shall conform to AWS D1.4. Welded splices shall be of ASTM A 706 steel reinforcement. Reinforcement larger than No. 9 (M #29) shall be spliced using mechanical connections in accordance with Section 2.1.9.7.3.

**2107.5 TMS 402/ACI 530/ASCE 5, Section 2.3.6, maximum bar size.** Add the following to Chapter 2:

2.3.6 Maximum bar size. The bar diameter shall not exceed one-eighth of the nominal wall thickness and shall not exceed one-quarter of the least dimension of the cell, course or collar joint in which it is placed.

## SECTION BC 2108 STRENGTH DESIGN OF MASONRY

**2108.1 General.** The design of masonry structures using strength design shall comply with Section 2106 and the requirements of Chapters 1 and 3 of TMS 402/ACI 530/ASCE 5, except as modified by Sections 2108.2 through 2108.3 of this code.

**Exception:** AAC masonry shall comply with the requirements of Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.

**2108.2 TMS 402/ACI 530/ASCE 5, Section 3.3.3.3 development.** Modify the second paragraph of Section 3.3.3.3 as follows:

The required development length of reinforcement shall be determined by Equation (3-16), but shall not be less than 12 inches (305 mm) and need not be greater than  $72 d_b$ .

**2108.3 TMS 402/ACI 530/ASCE 5, Section 3.3.3.4, splices.** Modify items (b) and (c) of Section 3.3.3.4 as follows:

3.3.3.4 (b). A welded splice shall have the bars butted and welded to develop at least 125 percent of the yield strength,  $f_y$ , of the bar in tension or compression, as required. Welded splices shall be of ASTM A 706 steel reinforcement. Welded splices shall not be permitted in plastic hinge zones of intermediate or special reinforced walls or special moment frames of masonry.

3.3.3.4 (c). Mechanical splices shall be classified as Type 1 or 2 according to Section 21.2.6.1 of ACI 318. Type 1 mechanical splices shall not be used within a plastic hinge zone or within a beam-column joint of intermediate or special reinforced masonry shear walls or special moment frames. Type 2 mechanical splices are permitted in any location within a member.

## SECTION BC 2109 EMPIRICAL DESIGN OF MASONRY

**2109.1 General.** Empirically designed masonry shall conform to this chapter or Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.

**2109.1.1 Limitations.** The use of empirical design of masonry shall be limited as noted in Section 5.1.2 of TMS 402/ACI 530/ASCE 5. The use of dry-stacked, surface-bonded masonry shall be prohibited in Occupancy Category IV structures. In buildings that exceed one or more of the limitations of Section 5.1.2 of TMS 402/ACI 530/ASCE 5, masonry shall be designed in accordance with the engineered design provisions of Section 2101.2.1, 2101.2.2 or 2101.2.3 of this code.

**2109.2 Surface-bonded walls.** Dry-stacked, surface-bonded concrete masonry walls shall comply with the requirements of Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.

**2109.2.1† Strength.** Dry-stacked, surface-bonded concrete masonry walls shall be of adequate strength and proportions to support all superimposed loads without exceeding the allowable stresses listed in Table 2109.2.1. Allowable stresses not specified in Table 2109.2.1 shall comply with the requirements of TMS 402/ACI 530/ASCE 5.

**TABLE 2109.2.1†  
ALLOWABLE STRESS GROSS CROSS-SECTIONAL  
AREA FOR DRY-STACKED, SURFACE-BONDED  
CONCRETE MASONRY WALLS**

DESCRIPTION	MAXIMUM ALLOWABLE STRESS (psi)
Compression standard block	45
Flexural tension	—
Horizontal span	30
Vertical span	18
Shear	10

For SI: 1 pound per square inch = 0.006895 mPa.



**2109.2.2† Construction.** Construction of dry-stacked, surface-bonded masonry walls, including stacking and leveling of units, mixing and application of mortar and curing and protection shall comply with ASTM C 946.

**2109.3 Reserved.**

**2109.4 Reserved.**

**2109.5 Thickness of masonry.** Minimum thickness requirements shall be based on nominal dimensions of masonry.

**2109.5.1 Thickness of walls.** The thickness of masonry walls shall conform to the requirements of Section 2109.5.

**2109.5.2 Minimum thickness.** The minimum thickness of masonry bearing walls more than one story high shall be 8 inches (203 mm) where the height floor to floor does not exceed 12 feet (3658 mm), the floor live load does not exceed 60 pounds per square feet (psf) (0.156 kg/m<sup>2</sup>), and the roof is designed so that the dead load imparts no lateral thrust to the wall. Bearing walls of one-story buildings shall not be less than 6 inches (152 mm) thick. However, the overall thickness of cavity or masonry-bonded hollow walls shall not be less than 8 inches (203 mm), including cavity.

**2109.5.2.1 Walls above roof level.** Masonry walls above roof level, 12 feet (3658 mm) or less in height, enclosing stairways, machinery rooms, shafts, or penthouses, may be up to 8 inches (203 mm) thick and shall be considered as neither increasing the height, nor requiring any increase in the thickness of the wall below.

**2109.5.3 Partitions.** The minimum thickness for partitions shall be as follows:

**TABLE 2109.5.3  
MINIMUM THICKNESS OF MASONRY PARTITIONS**

HEIGHT OF WALLS	THICKNESS (inches)†
8 ft. and under	2
Over 8 ft. to 12 ft	3
Over 12 ft. to 16 ft	4
Over 16 ft. to 20 ft	6
Over 20 ft. to 24 ft.	8

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**2109.6 Reserved.**

**2109.7 Horizontal joints.** All concrete framed buildings to be constructed over 35 feet (10 668 mm) in height (as measured from adjoining grade to the main roof level), whose exterior wythe are of cavity wall construction with steel lintels, shall have horizontal joints in the exterior wythe to prevent masonry distress induced by vertical shortening of the structural frame.

**2109.7.1 Joint minimum thickness.** Unless substantiated as indicated by Section 2109.7.2, horizontal joints shall be 1/4 inch (6.4 mm) minimum thickness, with neoprene, polyethylene, or urethane gasket or equivalent joint filler filling the entire joint, except for a recess from the toe of the lintel angle to the exterior of the facing brick, to provide space for caulking. These joints shall be placed at each floor.

**2109.7.2 Joint thickness by analysis.** The applicant of record shall submit an engineering analysis establishing that proposed building horizontal joints spaced further apart than in Section 2109.7.1 are sufficient to provide for the effects of vertical shortening of the structural frame.

## SECTION BC 2110 GLASS UNIT MASONRY

**2110.1† General.** Glass unit masonry construction shall comply with Chapter 7 of TMS 402/ACI 530/ASCE 5 and this section.

**2110.1.1 Limitations.** Solid or hollow approved glass block shall not be used in firewalls, party walls, fire barriers or fire partitions, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other approved joint materials. Wood strip framing shall not be used in walls required to have a fire-resistance rating by other provisions of this code.

### Exception:

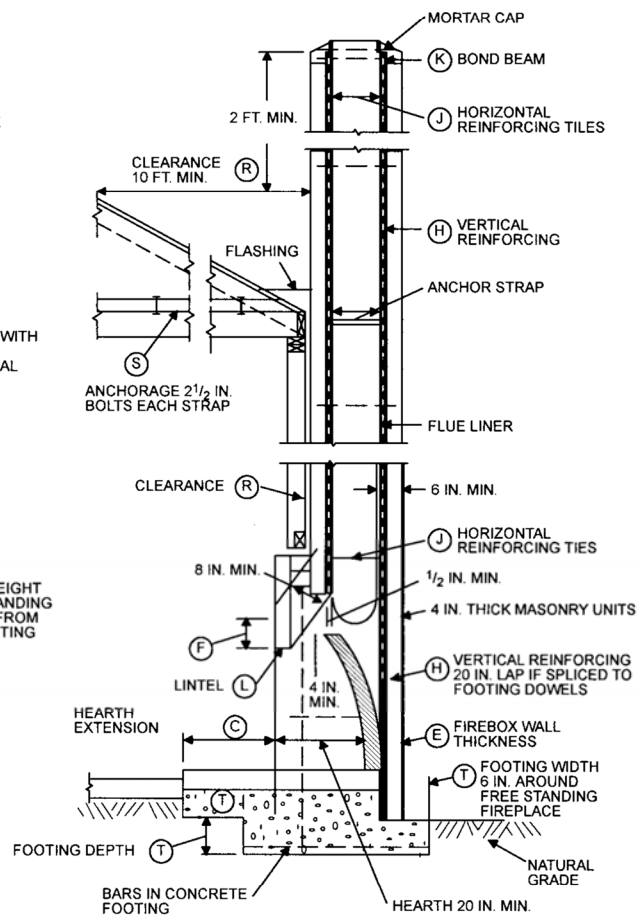
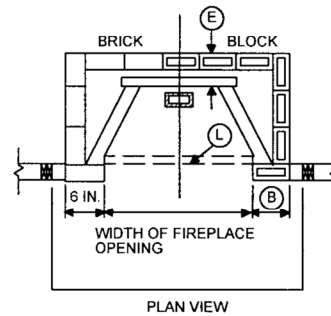
1. Glass block assemblies having a fire protection rating of not less than 3/4 hour shall be permitted as opening protectives in accordance with Section 715 in fire barriers, fire partitions and smoke barriers that have a required fire-resistance rating of 1 hour and do not enclose exit stairways or exit passageways.
2. Glass block assemblies as permitted in Section 404.6, Exception 2.

## SECTION BC 2111 MASONRY FIREPLACES

**2111.1 Definition.** A masonry fireplace is a fireplace constructed of concrete or masonry. Masonry fireplaces shall be constructed in accordance with this section, Table 2111.1 and Figure 2111.1.

[illegible][illegible][illegible]

- [illegible]



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**2111.2 Footings and foundations.** Footings for masonry fireplaces and their chimneys shall be constructed of reinforced concrete or solid masonry at least 12 inches (305 mm) thick and shall extend at least 6 inches (152 mm) beyond the face of the fireplace or foundation wall on all sides. Footings shall be founded on natural undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be at least 12 inches (305 mm) below finished grade.

**2111.2.1 Ash dump clean-out.** Clean-out openings, located within foundation walls below fireboxes, when provided, shall be equipped with ferrous metal or masonry doors and frames constructed to remain tightly closed, except when in use. Clean outs shall be accessible and located so that ash removal will not create a hazard to combustible materials.

**2111.2.2 Elevated fireplaces.** Fireplaces not supported on foundations shall be supported on noncombustible construction having a minimum fire-resistance rating of 3 hours for the elements in contact with the fireplace. Structural elements not directly in contact with the fireplace shall only be required to meet the fire-resistance rating specified elsewhere in this code.

**2111.3 Seismic reinforcing.** Masonry or concrete fireplaces shall be constructed, anchored, supported and reinforced as required in this chapter. In Seismic Design Category C or D, masonry and concrete fireplaces shall be reinforced and anchored as detailed in Sections 2111.3.1, 2111.3.2, 2111.4 and 2111.4.1 for chimneys serving fireplaces. In Seismic Design Category B, reinforcement and seismic anchorage is not required.

**2111.3.1 Vertical reinforcing.** For fireplaces with chimneys up to 40 inches (1016 mm) wide, four No. 4 continuous vertical bars, anchored in the foundation, shall be placed in the concrete, between wythes of solid masonry or within the cells of hollow unit masonry and grouted in accordance with Section 2103.12. For fireplaces with chimneys greater than 40 inches (1016 mm) wide, two additional No. 4 vertical bars shall be provided for each additional 40 inches (1016 mm) in width or fraction thereof.

**2111.3.2 Horizontal reinforcing.** Vertical reinforcement shall be placed enclosed within  $\frac{1}{4}$ -inch (6.4 mm) ties or other reinforcing of equivalent net cross-sectional area, spaced not to exceed 18 inches (457 mm) on center in concrete; or placed in the bed joints of unit masonry at a minimum of every 18 inches (457 mm) of vertical height. Two such ties shall be provided at each bend in the vertical bars.

**2111.4 Seismic anchorage.** Masonry and concrete chimneys in Seismic Design Category C or D shall be anchored at each floor, ceiling or roof line more than 6 feet (1829 mm) above grade, except where constructed completely within the exterior walls. Anchorage shall conform to the following requirements.

**2111.4.1 Anchorage.** Two  $\frac{3}{16}$ -inch by 1-inch (4.8 mm by 25 mm) straps shall be embedded a minimum of 12 inches (305 mm) into the chimney. Straps shall be hooked

around the outer bars and extend 6 inches (152 mm) beyond the bend. Each strap shall be fastened to a minimum of four floor joists with two  $\frac{1}{2}$ -inch (12.7 mm) bolts.

**2111.5 Firebox walls.** Masonry fireboxes shall be constructed of solid masonry units, hollow masonry units grouted solid, stone or concrete. When a lining of firebrick at least 2 inches (51 mm) in thickness or other approved lining is provided, the minimum thickness of back and side-walls shall each be 8 inches (203 mm) of solid masonry, including the lining. The approved lining shall be able to withstand a temperature of 2000°F (1093°C) without cracking. The width of joints between firebricks shall not be greater than  $\frac{1}{4}$  inch (6.4 mm). When no lining is provided, the total minimum thickness of back and side-walls shall be 12 inches (305 mm) of solid masonry. Firebrick shall conform to ASTM C 27 or ASTM C 1261 and shall be laid with medium-duty refractory mortar conforming to ASTM C 199.

**2111.5.1 Steel fireplace units.** Steel fireplace units are permitted to be installed with solid masonry to form a masonry fireplace provided they are installed according to either the requirements of their listing or the requirements of this section. Steel fireplace units incorporating a steel firebox lining shall be constructed with steel not less than  $\frac{1}{4}$  inch (6.4 mm) in thickness, and an air-circulating chamber which is ducted to the interior of the building. The firebox lining shall be encased with solid masonry to provide a total thickness at the back and sides of not less than 8 inches (203 mm), of which not less than 4 inches (102 mm) shall be of solid masonry or concrete. Circulating air ducts employed with steel fireplace units shall be constructed of metal or masonry.

**2111.6 Firebox dimensions.** The firebox of a concrete or masonry fireplace shall have a minimum depth of 20 inches (508 mm). The throat shall not be less than 8 inches (203 mm) above the fireplace opening. The throat opening shall not be less than 4 inches (102 mm) in depth. The cross-sectional area of the passageway above the firebox, including the throat, damper and smoke chamber, shall not be less than the cross-sectional area of the flue.

**Exception:** Rumford fireplaces shall be permitted provided that the depth of the fireplace is at least 12 inches (305 mm) and at least one-third of the width of the fireplace opening, and the throat is at least 12 inches (305 mm) above the lintel, and at least  $\frac{1}{20}$  the cross-sectional area of the fireplace opening.

**2111.7 Lintel and throat.** Masonry over a fireplace opening shall be supported by a lintel of noncombustible material. The minimum required bearing length on each end of the fireplace opening shall be 4 inches (102 mm). The fireplace throat or damper shall be located a minimum of 8 inches (203 mm) above the top of the fireplace opening.

**2111.7.1 Damper.** Masonry fireplaces shall be equipped with a ferrous metal damper located at least 8 inches (203 mm) above the top of the fireplace opening. Dampers shall be installed in the fireplace or at the top of the flue venting the fireplace, and shall be operable from the room containing the fireplace. Damper controls shall be permit-



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ted to be located in the fireplace. The damper shall be able to withstand distortion from binding, cracking or corrosion when exposed to the fireplace operating temperature.

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2111.8 **Smoke chamber walls.** Smoke chamber walls shall be constructed of solid masonry units, hollow masonry units grouted solid, stone or concrete. Corbeling of masonry units shall not leave unit cores exposed to the inside of the smoke chamber. The inside surface of corbeled masonry shall be parged smooth. Where no lining is provided, the total minimum thickness of front, back and side walls shall be 8 inches (203 mm) of solid masonry. When a lining of firebrick at least 2 inches (51 mm) thick, or a lining of vitrified clay at least  $\frac{5}{8}$  inch (15.9 mm) thick, is provided, the total minimum thickness of front, back and side walls shall be 6 inches (152 mm) of solid masonry, including the lining. Firebrick shall conform to ASTM C 27 or ASTM C 1261 and shall be laid with refractory mortar conforming to ASTM C 199. Verified clay linings shall conform to ASTM C 315.

2111.8.1 **Smoke chamber dimensions.** The inside height of the smoke chamber from the fireplace throat to the beginning of the flue shall not be greater than the inside width of the fireplace opening. The inside surface of the smoke chamber shall not be inclined more than 45 degrees (0.76 rad) from vertical when prefabricated smoke chamber linings are used or when the smoke chamber walls are rolled or sloped rather than corbeled. When the inside surface of the smoke chamber is formed by corbeled masonry, the walls shall not be corbeled more than 30 degrees (0.52 rad) from vertical.

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2111.9 **Hearth and hearth extension.** Masonry fireplace hearths and hearth extensions shall be constructed of concrete, ceramic tile, masonry or equivalent, supported by non-combustible materials, and reinforced to carry their own weight and all imposed loads. No combustible material shall remain against the underside of hearths or hearth extensions after construction.

2111.9.1 **Hearth thickness.** The minimum thickness of fireplace hearths shall be 4 inches (102 mm).

2111.9.2 **Hearth extension thickness.** The minimum thickness of hearth extensions shall be 2 inches (51 mm).

**Exception:** When the bottom of the firebox opening is raised at least 8 inches (203 mm) above the top of the hearth extension, a hearth extension of not less than  $\frac{3}{8}$ -inch-thick (9.5 mm) brick, concrete, stone, tile or other approved noncombustible material is permitted.

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2111.10 **Hearth extension dimensions.** Hearth extensions shall extend at least 16 inches (406 mm) in front of, and at least 8 inches (203 mm) beyond, each side of the fireplace opening. Where the fireplace opening is 6 square feet (0.56 m<sup>2</sup>) or larger, the hearth extension shall extend at least 20 inches (508 mm) in front of, and at least 12 inches (305 mm) beyond, each side of the fireplace opening.

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2111.10.1 **Elevated or overhanging fireplace.** Where a fireplace is elevated or overhangs a floor, the hearth extension shall also extend over the area under the fireplace.

2111.11 **Fireplace clearance.** Any portion of a masonry fireplace located in the interior of a building or within the exterior wall of a building shall have a clearance to combustibles of not less than 2 inches (51 mm) from the front faces and sides of masonry fireplaces and not less than 4 inches (102 mm) from the back faces of masonry fireplaces. The airspace shall not be filled, except to provide fireblocking in accordance with Section 2111.13.

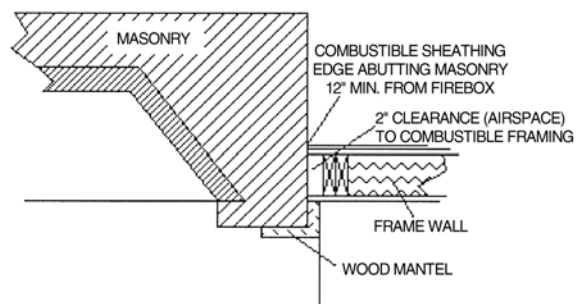
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**Exceptions:**

1. Masonry fireplaces listed and labeled for use in contact with combustibles in accordance with UL 127, and installed in accordance with the manufacturer's installation instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. When masonry fireplaces are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete walls less than 12 inches (306 mm) from the inside surface of the nearest firebox lining.
3. Exposed combustible trim and the edges of sheathing materials, such as wood siding, flooring and dry-wall, are permitted to abut the masonry fireplace sidewalls and hearth extension, in accordance with Figure 2111.11, provided such combustible trim or sheathing is a minimum of 12 inches (306 mm) from the inside surface of the nearest firebox lining.
4. Exposed combustible mantels or trim is permitted to be placed directly on the masonry fireplace front surrounding the fireplace opening provided such combustible materials shall not be placed within 6 inches (153 mm) of a fireplace opening. Combustible material within 12 inches (306 mm) of the fireplace opening shall not project more than  $\frac{1}{8}$  inch (3.2 mm) for each 1-inch (25 mm) distance from such opening.

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For SI: 1 inch = 25.4 mm

**FIGURE 2111.11  
ILLUSTRATION OF EXCEPTION TO  
FIREPLACE CLEARANCE PROVISION**

2111.12 **Mantel and trim.** Woodwork or other combustible materials shall not be placed within 6 inches (152 mm) of a fireplace opening. Combustible material within 12 inches (305 mm) of the fireplace opening shall not project more than  $\frac{1}{8}$  inch (3.2 mm) for each 1-inch (25 mm) distance from such opening.

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**2111.13 Fireplace fireblocking.** All spaces between fireplaces and floors and ceilings through which fireplaces pass shall be fireblocked with approved noncombustible material securely fastened in place. The fireblocking of spaces between wood joists, beams or headers shall be to a depth of 1 inch (25 mm) and shall only be placed on strips of metal or metal lath laid across the spaces between combustible material and the chimney.

**2111.14 Exterior air.** Factory-built or masonry fireplaces covered in this section shall be equipped with an exterior air supply to ensure proper fuel combustion unless the room is mechanically ventilated and controlled so that the indoor pressure is neutral or positive.

**2111.14.1 Factory-built fireplaces.** Exterior combustion air ducts for factory-built fireplaces shall be listed components of the fireplace, and installed according to the fireplace manufacturer's instructions.

**2111.14.2 Masonry fireplaces.** Listed combustion air ducts for masonry fireplaces shall be installed according to the terms of their listing and manufacturer's instructions.

**2111.14.3 Exterior air intake.** The exterior air intake shall be capable of providing all combustion air from the exterior of the dwelling. The exterior air intake shall not be located within the garage, attic, basement or crawl space of the dwelling nor shall the air intake be located at an elevation higher than the firebox. The exterior air intake shall be covered with a corrosion-resistant screen of 1/4-inch (6.4 mm) mesh.

**2111.14.4 Clearance.** Unlisted combustion air ducts shall be installed with a minimum 1-inch (25 mm) clearance to combustibles for all parts of the duct within 5 feet (1524 mm) of the duct outlet.

**2111.14.5 Passageway.** The combustion air passageway shall be a minimum of 6 square inches (3870 mm<sup>2</sup>) and not more than 55 square inches (0.035 m<sup>2</sup>), except that combustion air systems for listed fireplaces or for fireplaces tested for emissions shall be constructed according to the fireplace manufacturer's instructions.

**2111.14.6 Outlet.** The exterior air outlet is permitted to be located in the back or sides of the firebox chamber or within 24 inches (610 mm) of the firebox opening on or near the floor. The outlet shall be closable and designed to prevent burning material from dropping into concealed combustible spaces.

## SECTION BC 2112 MASONRY HEATERS

**2112.1 Definition.** A masonry heater is a heating appliance constructed of concrete or solid masonry, hereinafter referred to as "masonry," which is designed to absorb and store heat from a solid fuel fire built in the firebox by routing the exhaust gases through internal heat exchange channels in which the flow path downstream of the firebox may include flow in a horizontal or downward direction before entering the chimney and which delivers heat by radiation from the masonry surface of the heater.

**2112.2 Installation.** Masonry heaters may be installed only when their use is permitted by the *New York City Air Pollution Control Code*. When such use is permitted, such appliances shall be operated in compliance with the *New York City Air Pollution Control Code*. Masonry heaters shall also be installed in accordance with this section and comply with one of the following:

1. Masonry heaters shall comply with the requirements of ASTM E 1602; or
2. Masonry heaters shall be listed and labeled in accordance with UL 1482 and installed in accordance with the manufacturer's installation instructions.

**2112.3 Footings and foundation.** The firebox floor of a masonry heater shall be a minimum thickness of 4 inches (102 mm) of noncombustible material and be supported on a noncombustible footing and foundation in accordance with Section 2113.2.

**2112.4 Seismic reinforcing.** In Seismic Design Category D, masonry heaters shall be anchored to the masonry foundation in accordance with Section 2113.3. Seismic reinforcing shall not be required within the body of a masonry heater with a height that is equal to or less than 3.5 times its body width and where the masonry chimney serving the heater is not supported by the body of the heater. Where the masonry chimney shares a common wall with the facing of the masonry heater, the chimney portion of the structure shall be reinforced in accordance with Section 2113.

**2112.5 Masonry heater clearance.** Combustible materials shall not be placed within 36 inches (765 mm) of the outside surface of a masonry heater in accordance with NFPA 211, Section 8-7 (clearances for solid fuel-burning appliances), and the required space between the heater and combustible material shall be fully vented to permit the free flow of air around all heater surfaces.

### Exceptions:

1. ‡When the masonry heater wall thickness is at least 8 inches (203 mm) thick of solid masonry and the wall thickness of the heat exchange channels is at least 5 inches (127 mm) thick of solid masonry, combustible materials shall not be placed within 4 inches (102 mm) of the outside surface of a masonry heater. A clearance of at least 8 inches (203 mm) shall be provided between the gas-tight capping slab of the heater and a combustible ceiling.
2. ‡Masonry heaters listed and labeled in accordance with UL 1482 and installed in accordance with the manufacturer's instructions.

## SECTION BC 2113 MASONRY CHIMNEYS

**2113.1 General.** A masonry chimney is a chimney constructed of concrete or masonry, hereinafter referred to as "masonry." Masonry chimneys shall be constructed, anchored, supported and reinforced as required in this chapter.

Chimneys shall be designed and constructed so as to provide the necessary draft and capacity for each appliance connected to them to completely exhaust the products of combustion to the outside air. The temperature on adjacent combustible surfaces shall not be raised above 160°F (71°C). Chimney and vents shall be designed to resist the effects of condensation that would cause deterioration of the chimney or vent.

In any case, the outlet shall be arranged so that the flue gases are not directed so that they jeopardize people, overheat combustible structures, or enter building openings in the vicinity of the outlet. Gas-fired appliances shall be vented in accordance with this code, the *New York City Fuel Gas Code* and NFPA 54.

Chimneys shall not be supported by the equipment they serve unless such equipment has been specifically designed for such loads.

**2113.1.1 Chimney adequacy for temperature and gas action.** Chimneys shall be of adequate structural strength and resistant to the temperatures to which they may be subjected and to the corrosive action of gases.

**2113.1.2 Chimney caps.** Termination caps shall not be permitted and a 3-inch (76 mm) minimum drain shall be installed to receive collected water. A positive means shall be provided to prevent water from entering the appliance.

**Exception:** Termination caps shall be permitted on listed factory-built chimneys.

**2113.1.2.1 Decorative shrouds.** Decorative shrouds shall not be installed at the termination of factory-built chimneys except where such shrouds are listed and labeled for use with the specific factory-built chimney system and are installed in accordance with the manufacturers' installation instructions.

**2113.1.3 Chimney linings.** The lining in chimneys shall not be considered as taking either compression or tension stresses.

**2113.1.4 Chimney expansion and contraction.** Expansion and contraction in chimney walls due to temperature variations shall be accommodated solely by the use of steel reinforcing rings.

**2113.1.5 Reinforcing rings.** Reinforcing rings shall be provided at all changes in wall thickness, at the top of the chimney, and above and below all flue openings.

**2113.1.6 Adjoining chimneys and vents.** Adjoining chimneys and vents shall be in accordance with Sections 2113.1.6.1 through 2113.1.6.8.

**2113.1.6.1 Responsibility of owner of taller building.** Whenever a building is erected, enlarged, or increased in height so that any portion of such building, except chimneys or vents, extends higher than the top of any previously constructed chimneys or vents within 100 feet (30 480 mm), the owner of such new or altered building shall have the responsibility of altering such chimneys or vents to make them conform with the requirements of this chapter. A chimney or vent that is

no longer connected with a fireplace or combustion or other equipment for which a chimney or vent was required, shall be exempt from this requirement. Such alterations shall be accomplished by one of the following means or a combination thereof:

1. Carry up the previously constructed chimneys or vents to the height required in this chapter.
2. Offset such chimneys or vents to a distance beyond that required in this chapter from the new or altered building provided that the new location of the outlet of the offset chimney or vent shall otherwise comply with the requirements of this chapter.
3. Such requirements shall not dispense with or modify any additional requirements that may be applicable pursuant to rules of the New York City Department of Environmental Protection.

**2113.1.6.2 Protection of draft.** After the alteration of a chimney or vent as required by this section, it shall be the responsibility of the owner of the new or altered building to provide any mechanical equipment or devices necessary to maintain the proper draft in the equipment.

**2113.1.6.3 Written notification.** The owner of the new or altered building shall notify the owner of the building affected in writing at least 45 days before starting the work required and request written consent to do such work. Such notice shall be accompanied by plans indicating the manner in which the proposed alterations are to be made.

**2113.1.6.4 Approval.** The plans and method of alteration shall be subject to the approval of the commissioner.

**2113.1.6.5 Refusal of consent.** If consent is not granted by the owner of the previously constructed building to do the alteration work required by this section, such owner shall signify his or her refusal in writing to the owner of the new or altered building and to the commissioner; and the owner of the new or altered building having submitted plans that conform to the requirements of this section, shall thereupon be released from any responsibility for the proper operation of the equipment due to loss of draft and for any health hazard or nuisance that may occur as a result of the new or altered building. Such responsibilities shall then be assumed by the owner of the previously constructed building. Similarly, should such owner fail to grant consent within 45 days from the date of written request or fail to signify his or her refusal, he or she shall then assume all responsibilities as prescribed above.

**2113.1.6.6 Procedure.** It shall be the obligation of the owner of the new or altered building to:

1. Schedule this work so as to create a minimum of disturbance to the occupants of the affected building; and



2. Provide such essential services as are normally supplied by the equipment while it is out of service; and
3. Where necessary, support such extended chimneys, vents and equipment from this building or to carry up such chimneys or vents within his or her building; and
4. Provide for the maintenance, repair, and/or replacement of such extensions and added equipment; and
5. Make such alterations of the same material as the original chimney or vent so as to maintain the same quality and appearance, except where the affected owner of the chimney or vent shall give his or her consent to do otherwise. All work shall be done in such fashion as to maintain the architectural aesthetics of the existing building. Where there is practical difficulty in complying strictly with the provisions of this item, the commissioner may permit an equally safe alternative.

**2113.1.6.7 Existing violations.** Any existing violations on the previously constructed equipment shall be corrected by the owner of the equipment before any equipment is added or alterations made at the expense of the owner of the new or altered building.

**2113.1.6.8 Variance.** The commissioner may grant a variance in accordance with the provisions of this code.

**2113.2 Footings and foundations.** Foundations for masonry chimneys shall be constructed of concrete or solid masonry at least 12 inches (305 mm) thick and shall extend at least 6 inches (152 mm) beyond the face of the foundation or support wall on all sides. Footings shall be founded on natural undisturbed earth or engineered fill below frost depth. In areas not subjected to freezing, footings shall be at least 12 inches (305 mm) below finished grade.

**2113.3 Seismic reinforcing.** Masonry or concrete chimneys shall be constructed, anchored, supported and reinforced as required in this chapter. In Seismic Design Category C or D, masonry and concrete chimneys shall be reinforced and anchored as detailed in Sections 2113.3.1, 2113.3.2, and 2113.4. In Seismic Design Category B, reinforcement and seismic anchorage is not required.

**2113.3.1 Vertical reinforcing.** For chimneys up to 40 inches (1016 mm) wide, four No. 4 continuous vertical bars anchored in the foundation shall be placed in the concrete, between wythes of solid masonry or within the cells of hollow unit masonry and grouted in accordance with Section 2103.10. Grout shall be prevented from bonding with the flue liner so that the flue liner is free to move with thermal expansion. For chimneys greater than 40 inches (1016 mm) wide, two additional No. 4 vertical bars shall be provided for each additional 40 inches (1016 mm) in width or fraction thereof.

**2113.3.2 Horizontal reinforcing.** Vertical reinforcement shall be placed enclosed within  $\frac{1}{4}$ -inch (6.4 mm) ties, or other reinforcing of equivalent net cross-sectional area,

spaced not to exceed 18 inches (457 mm) o.c. in concrete, or placed in the bed joints of unit masonry, at a minimum of every 18 inches (457 mm) of vertical height. Two such ties shall be provided at each bend in the vertical bars.

**2113.4 Seismic anchorage.** Masonry and concrete chimneys and foundations in Seismic Design Category C or D shall be anchored at each floor, ceiling or roof line more than 6 feet (1829 mm) above grade, except where constructed completely within the exterior walls. Anchorage shall conform to the following requirements.

**2113.4.1 Anchorage.** Two  $\frac{3}{16}$ -inch by 1-inch (4.8 mm by 25 mm) straps shall be embedded a minimum of 12 inches (305 mm) into the chimney. Straps shall be hooked around the outer bars and extend 6 inches (152 mm) beyond the bend. Each strap shall be fastened to a minimum of four floor joists with two  $\frac{1}{2}$ -inch (12.7 mm) bolts.

**2113.5 Corbeling.** Masonry chimneys shall not be corbeled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second story of a two-story dwelling, corbeling of chimneys on the exterior of the enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less. No masonry shall be corbeled from hollow or cavity wall masonry units.

**2113.6 Changes in dimension.** The chimney wall or chimney flue lining shall not change in size or shape within 6 inches (152 mm) above or below where the chimney passes through floor components, ceiling components or roof components.

**2113.7 Offsets.** Where a masonry chimney is constructed with a fireclay flue liner surrounded by one wythe of masonry, the maximum offset shall be such that the centerline of the flue above the offset does not extend beyond the center of the chimney wall below the offset. Where the chimney offset is supported by masonry below the offset in an approved manner, the maximum offset limitations shall not apply. Each individual corbeled masonry course of the offset shall not exceed the projection limitations specified in Section 2113.5.

**2113.8 Additional load.** Chimneys shall not support loads other than their own weight unless they are designed and constructed to support the additional load. Masonry chimneys are permitted to be constructed as part of the masonry walls or concrete walls of the building.

**2113.9 Termination.** Chimneys serving appliances that operate at less than 600°F (316°C) shall extend at least 3 feet (914 mm) above the highest construction, such as a roof ridge, parapet wall, or penthouse, within 10 feet (3048 mm) of the chimney outlet, whether the construction is on the same building as the chimney or on another building. However, such constructions do not include other chimneys, vents, or open structural framing. Any chimney located beyond 10 feet (3048 mm) from such construction, but not



more than the distance determined from Equation 21-5 and Table 2113.9, shall be at least as high as the construction.

Chimneys serving appliances that operate at between 600°F (316°C) and 1,000°F (538°C) shall extend at least 10 feet (3048 mm) above the highest construction, such as a roof ridge, or parapet wall or penthouse within 20 feet (6096 mm) of the chimney outlet, whether the construction is on the same building as the chimney or on another building. However, such construction does not include other chimneys, vents or open structural framing. Any chimney located beyond 20 feet (6096 mm) from such construction, but not more than the distance determined from Equation 21-5 and Table 2113.9, shall be at least as high as the construction.

$$D = F \times \sqrt{A} \quad (\text{Equation 21-5})$$

where:

$D$  = Distance, in feet, measured from the center of the chimney outlet to the nearest edge of the construction.

$F$  = Value determined from Table 2113.9.

$A$  = Free area, in square inches, of chimney flue space.

**2113.9.1 Spark arrestors.** Where a spark arrestor is installed on a masonry chimney, the spark arrestor shall meet all of the following requirements:

1. The net free area of the arrestor shall not be less than four times the net free area of the outlet of the chimney flue it serves.
2. The arrestor screen shall have heat and corrosion resistance equivalent to 19-gage galvanized steel or 24-gage stainless steel.
3. Openings shall not permit the passage of spheres having a diameter greater than  $\frac{1}{2}$  inch (12.7 mm) nor block the passage of spheres having a diameter less than  $\frac{3}{8}$  inch (9.5 mm).
4. The spark arrestor shall be accessible for cleaning and the screen or chimney cap shall be removable to allow for cleaning of the chimney flue.

**2113.10 Wall thickness.** Masonry chimney walls shall be constructed of concrete, solid masonry units or hollow masonry units grouted solid with not less than 4 inches (102 mm) nominal thickness, or 8 inches (203 mm) nominal thickness for chimney walls extending more than 3 feet (914 mm) above the highest lateral support point.

**2113.11 Flue lining (material).** Masonry chimneys shall be lined. The lining material shall be appropriate for the type of

appliance connected, according to the terms of the appliance listing and the manufacturer's instructions.

**2113.11.1 Residential-type appliances and low heat appliances (general).** Flue lining systems shall comply with one of the following:

1. Clay flue lining complying with the requirements of ASTM C 315.
2. Listed chimney lining systems complying with UL 1777.
3. Factory-built chimneys or chimney units listed for installation within masonry chimneys.
4. Other approved materials that will resist corrosion, erosion, softening or cracking from flue gases and condensate at temperatures up to 1,800°F (982°C).

**2113.11.1.1 Flue linings for specific appliances.** Flue linings other than those covered in Section 2113.11.1 intended for use with specific appliances shall comply with Sections 2113.11.1.2 through 2113.11.1.4 and Sections 2113.11.2 and 2113.11.3.

**2113.11.1.2 Gas appliances.** Flue lining systems for gas appliances shall be in accordance with the *New York City Fuel Gas Code* and ULC-S635.

**2113.11.1.3 Pellet fuel-burning appliances.** Pellet fuel-burning appliances may be installed only when their use is permitted by the *New York City Air Pollution Control Code*. Any such appliances shall be listed and labeled and shall be installed in accordance with the terms of the listing. If permitted, such appliances shall be operated in compliance with the *New York City Air Pollution Control Code*. Flue lining and vent systems for use in masonry chimneys with pellet fuel-burning appliances shall be limited to flue lining systems complying with Section 2113.11.1 and pellet vents listed for installation within masonry chimneys (see Section 2113.11.1.5 for marking).

**2113.11.1.4 Oil-fired appliances approved for use with L-vent.** Flue lining and vent systems for use in masonry chimneys with oil-fired appliances approved for use with Type L vent shall be limited to flue lining systems complying with Section 2113.11.1 and listed chimney liners complying with UL 641 (see Section 2113.11.1.5 for marking).

**2113.11.1.5 Notice of usage.** When a flue is relined with a material not complying with Section 2113.11.1,

**TABLE 2113.9**  
**"F" FACTOR FOR DETERMINING CHIMNEY DISTANCES**

TYPE OF FUEL	"F" FACTOR		
	600°F (316°C) and less	600°F (316°C) to 1000°F (538°C)	Greater than 1000°F (538°C)
Gas	2	2	3
No. 2 fuel oil	2.5	2.5	3
No. 4, No. 6 fuel oils, solid fuels and incinerators	3	3	3

the chimney shall be plainly and permanently identified by a label attached to a wall, ceiling or other conspicuous location adjacent to where the connector enters the chimney. The label shall include the following message or equivalent language: "This chimney is for use only with (type or category of appliance) that burns (type of fuel). Do not connect other types of appliances."

### 2113.11.2 Concrete and masonry chimneys for medium heat appliances.

**2113.11.2.1 General.** Concrete and masonry chimneys for medium-heat appliances shall comply with Sections 2113.1 through 2113.5.

**2113.11.2.2 Construction.** Chimneys for medium-heat appliances shall be constructed of solid masonry units or of concrete with walls a minimum of 8 inches (203 mm) thick, or with stone masonry a minimum of 12 inches (305 mm). Chimneys for medium-heat appliances constructed with radial brick may be permitted to have different requirements. Design of all such chimneys shall be submitted to the commissioner for approval.

**2113.11.2.3 Lining.** Concrete and masonry chimneys shall be lined with an approved medium-duty refractory brick a minimum of 4½ inches (114 mm) thick laid on the 4½-inch bed (114 mm) in an approved medium-duty refractory mortar. The lining shall start 2 feet (610 mm) or more below the lowest chimney connector entrance. Chimneys terminating 25 feet (7620 mm) or less above a chimney connector entrance shall be lined to the top.

**2113.11.2.4 Multiple passageway.** Concrete and masonry chimneys containing more than one passageway shall have the liners separated by a minimum 4-inch-thick (102 mm) concrete or solid masonry wall.

**2113.11.2.5 Termination height.** Chimneys serving appliances that operate at greater than 1,000°F (538°C) shall extend at least 20 feet (6096 mm) above the highest construction, such as roof ridge, parapet wall, penthouse, or other obstruction within 50 feet (15 240 mm) of the chimney outlet, whether the construction is on the same building as the chimney or in another building. However, such construction does not include other chimneys, vents, or open structural framing. Any chimney located beyond 50 feet (15 240 mm) from such construction but not more than the distance determined from Equation 21-5 and Table 2113.9, shall be at least as high as the construction.

**2113.11.2.6 Clearance.** A minimum clearance of 4 inches (102 mm) shall be provided between the exterior surfaces of a concrete or masonry chimney for medium-heat appliances and combustible material.

### 2113.11.3 Concrete and masonry chimneys for high-heat appliances.

**2113.11.3.1 General.** Concrete and masonry chimneys for high-heat appliances shall comply with Sections 2113.1 through 2113.5.

**2113.11.3.2 Construction.** Chimneys for high-heat appliances shall be constructed with double walls of solid masonry units or of concrete, each wall to be a minimum of 8 inches (203 mm) thick with a minimum airspace of 2 inches (51 mm) between the walls. Alternate chimney designs for high-heat appliances constructed with radial brick shall be permitted subject to the approval of the commissioner.

**2113.11.3.3 Lining.** The inside of the interior wall shall be lined with an approved high-duty refractory brick, a minimum of 4½ inches (114 mm) thick laid on the 4½-inch bed (114 mm) in an approved high-duty refractory mortar. The lining shall start at the base of the chimney and extend continuously to the top.

**2113.11.3.4 Termination height.** Concrete and masonry chimneys for high-heat appliances shall extend at least 20 feet (6069 mm) above the highest construction, such as roof ridge, parapet wall, penthouse, or other obstruction within 50 feet (15 240 mm) of the chimney outlet, whether the construction is on the same building as the chimney or on another building. However, such constructions do not include other chimneys, vents, or open structural framing. Any chimney located beyond 50 feet (15 240 mm) from such construction but not more than the distance determined from Equation 21-5 and Table 2113.9, shall be at least as high as the construction.

**2113.11.3.5 Clearance.** Concrete and masonry chimneys for high-heat appliances shall have approved clearance from buildings and structures to prevent overheating combustible materials, permit inspection and maintenance operations on the chimney and prevent danger of burns to persons.

**2113.12 Clay flue lining (installation).** Flue liners shall be installed in accordance with ASTM C 1283 and extend from a point not less than 8 inches (203 mm) below the lowest inlet or, in the case of fireplaces, from the top of the smoke chamber, to a point above the enclosing walls. The lining shall be carried up vertically, with a maximum slope no greater than 30 degrees (0.52 rad) from the vertical. Clay flue liners shall be laid in medium-duty refractory mortar conforming to ASTM C 199, with tight mortar joints left smooth on the inside and installed to maintain an airspace or insulation not to exceed the thickness of the flue liner separating the flue liners from the interior face of the chimney masonry walls. Flue lining shall be supported on all sides. Only enough mortar shall be placed to make the joint and hold the liners in position.

### 2113.13 Additional requirements.

**2113.13.1 Listed materials.** Listed materials used as flue linings shall be installed in accordance with the terms of their listings and the manufacturer's instructions.

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**2113.13.2 Space around lining.** The space surrounding a chimney lining system or vent installed within a masonry chimney shall not be used to vent any other appliance.

**Exception:** This shall not prevent the installation of a separate flue lining in accordance with the manufacturer's instructions.

**2113.14 Multiple flues.** When two or more flues are located in the same chimney, masonry wythes shall be built between adjacent flue linings. The masonry wythes shall be at least 4 inches (102 mm) thick and bonded into the walls of the chimney.

**Exception:** When venting only one appliance, two flues are permitted to adjoin each other in the same chimney with only the flue lining separation between them. The joints of the adjacent flue linings shall be staggered at least 4 inches (102 mm).

**2113.15 Flue area (appliance).** Chimney flues shall not be smaller in area than the area of the connector from the appliance. Chimney flues connected to more than one appliance shall not be less than the area of the largest connector plus 50 percent of the areas of additional chimney connectors.

**Exceptions:**

1. Chimney flues serving oil-fired appliances sized in accordance with the *New York City Mechanical Code* and NFPA 31.
2. Chimney flues serving gas-fired appliances sized in accordance with the *New York City Fuel Gas Code*.

**2113.16 Flue area (masonry fireplace).** Flue sizing for chimneys serving fireplaces shall be in accordance with Section 2113.16.1 or 2113.16.2.

**2113.16.1 Minimum area.** Round chimney flues shall have a minimum net cross-sectional area of at least  $\frac{1}{12}$  of the fireplace opening. Square chimney flues shall have a minimum net cross-sectional area of at least  $\frac{1}{10}$  of the fireplace opening. Rectangular chimney flues with an aspect ratio less than 2 to 1 shall have a minimum net cross-sectional area of at least  $\frac{1}{10}$  of the fireplace opening. Rectangular chimney flues with an aspect ratio of 2 to 1 or more shall have a minimum net cross-sectional area of at least  $\frac{1}{8}$  of the fireplace opening.

**2113.16.2 Determination of minimum area.** The minimum net cross-sectional area of the flue shall be determined in accordance with Figure 2113.16. A flue size providing at least the equivalent net cross-sectional area shall be used. Cross-sectional areas of clay flue linings are as provided in Tables 2113.16(1) and 2113.16(2) or as provided by the manufacturer or as measured in the field. The height of the chimney shall be measured from the firebox floor to the top of the chimney flue.

**TABLE 2113.16(1)**  
**NET CROSS-SECTIONAL AREA OF ROUND FLUE SIZES<sup>a</sup>**

FLUE SIZE, INSIDE DIAMETER (inches)	CROSS-SECTIONAL AREA (square inches)
6	28
7	38
8	50
10	78
10 <sup>3</sup> / <sub>4</sub>	90
12	113
15	176
18	254

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm<sup>2</sup>.  
a. Flue sizes are based on ASTM C 315.

**TABLE 2113.16(2)**  
**NET CROSS-SECTIONAL AREA OF SQUARE AND  
RECTANGULAR FLUE SIZES<sup>a</sup>**

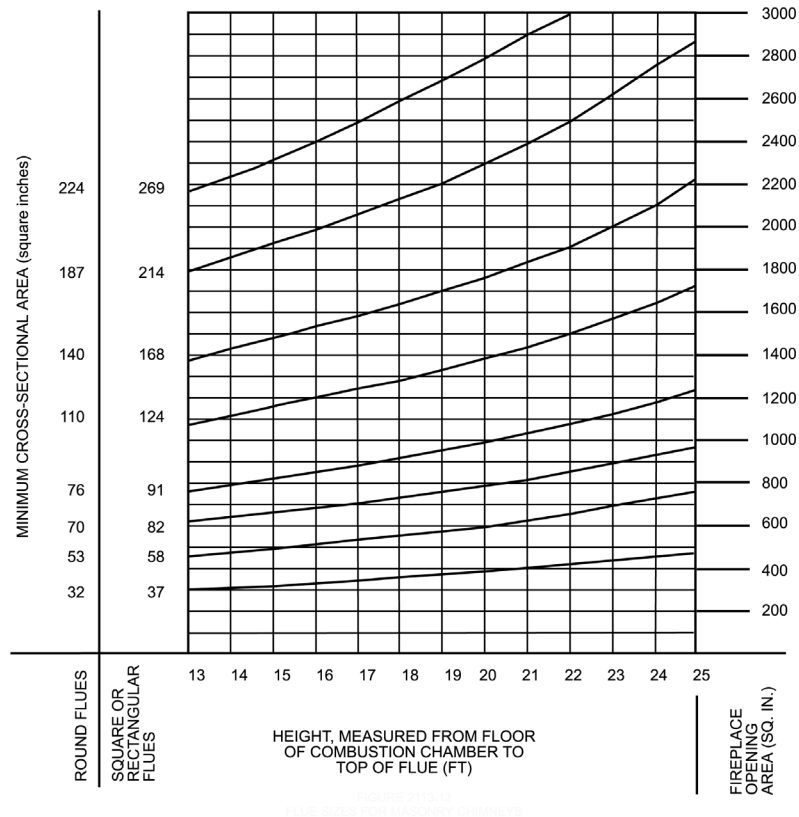
FLUE SIZE, OUTSIDE NOMINAL DIMENSIONS (inches)	CROSS-SECTIONAL AREA (square inches)
4.5 × 8.5	23
4.5 × 13	34
8 × 8	42
8.5 × 8.5	49
8 × 12	67
8.5 × 13	76
12 × 12	102
8.5 × 18	101
13 × 13	127
12 × 16	131
13 × 18	173
16 × 16	181
16 × 20	222
18 × 18	233
20 × 20	298
20 × 24	335
24 × 24	431

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm<sup>2</sup>.  
a. Flue sizes are based on ASTM C 315.†

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For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm<sup>2</sup>.

**FIGURE 2113.16**  
**FLUE SIZES FOR MASONRY CHIMNEYS**

**2113.17 Inlet.** Inlets to masonry chimneys shall enter from the side. Inlets shall have a thimble of fireclay, rigid refractory material or metal that will prevent the connector from pulling out of the inlet or from extending beyond the wall of the liner.

**2113.18 Masonry chimney cleanout openings.** Cleanout openings shall be provided within 6 inches (152 mm) of the base of each flue within every masonry chimney. The upper edge of the cleanout shall be located at least 6 inches (152 mm) below the lowest chimney inlet opening. The height of the opening shall be at least 6 inches (152 mm). The cleanout shall be provided with a noncombustible cover.

**Exception:** Chimney flues serving masonry fireplaces, where cleaning is possible through the fireplace opening.

**2113.19 Chimney clearances.** Any portion of a masonry chimney located in the interior of the building or within the exterior wall of the building shall have a minimum airspace clearance to combustibles of 2 inches (51 mm). Chimneys located entirely outside the exterior walls of the building, including chimneys that pass through the soffit or cornice, shall have a minimum airspace clearance of 1 inch (25 mm). The airspace shall not be filled, except to provide fireblocking in accordance with Section 2113.20.

#### Exceptions:

1. Masonry chimneys equipped with a chimney lining system listed and labeled for use in chimneys in contact with combustibles in accordance with UL 1777 and ULC-S635, and installed in accordance with the manufacturer's instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. Where masonry chimneys are constructed as part of masonry or concrete walls, combustible materials shall not be in contact with the masonry or concrete wall less than 12 inches (305 mm) from the inside surface of the nearest flue lining.
3. Exposed combustible trim and the edges of sheathing materials, such as wood siding, are permitted to abut the masonry chimney sidewalls, in accordance with Figure 2113.19, provided such combustible trim or sheathing is a minimum of 12 inches (305 mm) from the inside surface of the nearest flue lining. Combustible material and trim shall not overlap the corners of the chimney by more than 1 inch (25 mm).

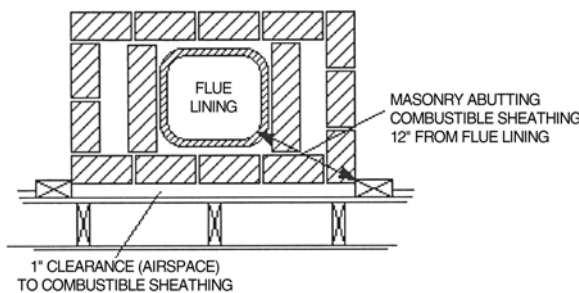
#### 2113.19.1 Additional requirements for clearance.

1. Trimmers shall be not less than 5 inches (127 mm) from the inside face of the concrete or masonry

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- chimney wall. Finished flooring shall have at least 1/2 inch (13 mm) clearance from chimney walls.
- A clearance of at least 2 inches (51 mm) shall be provided between the exterior surfaces of interior masonry or concrete chimneys for all wood-burning appliances.
  - No combustible lathing, furring, or plaster grounds shall be placed against a chimney at any point more than 1 1/2 inches (38 mm) from the corner of the chimney; but this shall not prevent plastering directly on masonry or on metal lath and metal furring nor shall it prevent placing chimneys for low-temperature equipment entirely on the exterior of a building against the sheathing.



For SI: 1 inch = 25.4 mm.

**FIGURE 2113.19**  
**ILLUSTRATION OF EXCEPTION TO CHIMNEY CLEARANCE PROVISION**

**2113.20 Chimney fireblocking.** All spaces between chimneys and floors and ceilings through which chimneys pass shall be fireblocked with noncombustible material securely fastened in place. The fireblocking of spaces between wood joists, beams or headers shall be to a depth of 1 inch (25 mm) and shall only be placed on strips of metal or metal lath laid across the spaces between combustible material and the chimney.

**2113.21 Test run.** All new chimneys shall be test run by the registered design professional responsible for the testing under standard conditions to demonstrate fire safety and the complete exhausting of smoke and the products of combustion to the outer air. The results of such test run shall be certified as correct by the design professional engineer responsible for the test and shall be submitted in writing to the department.

**2113.22 Requirement of a smoke test.** A smoke test shall be made as outlined below. Any faults or leaks found shall be corrected. Such smoke test shall be witnessed by a representative of the commissioner. In lieu thereof, the commissioner may accept the test report of the design professional engineer responsible for the test, which shall be submitted in writing to the department.

**2113.22.1 Smoke test.** To determine the tightness of chimney construction, a smoke test shall be made in accordance with the following conditions and requirements:

- The equipment, materials, power and labor necessary for such test shall be furnished by, and at the expense of, the owner or holder of the work permit.
- If the test shows any evidence of leakage or other defects, such defects shall be corrected in accordance with the requirement of this chapter and the test shall be repeated until the results are satisfactory.
- Method of test. The chimney shall be filled with a thick penetrating smoke produced by one or more smoke machines, or smoke bombs, or other equivalent method. As the smoke appears at the stack opening on the roof, such opening shall be tightly closed, and a pressure equivalent to 1/2 inch (12.7 mm) column of water measured at the base of the stack shall be applied. The test shall be conducted for a length of time sufficient to permit the inspection of the chimney.

## SECTION BC 2114 STRUCTURAL INTEGRITY REQUIREMENTS

**2114.1 General.** Load-bearing masonry structures shall be reinforced to meet all of the requirements of this section. However, reinforcement provided for gravity, seismic or wind forces or for other purposes may be regarded as satisfying part of, or the whole of, these requirements. Reinforcement provided for one requirement may be counted towards the other requirements.

**2114.2 Continuity and ties.** Load-bearing masonry structures shall be reinforced to obtain a continuous system of vertical and horizontal ties. Continuity of all ties shall be ensured by providing lap, welded or mechanical tension splices. The following requirements shall be met for walls, columns and piers:

**2114.2.1 Horizontal.** At each floor and roof level, continuous horizontal ties shall be provided in all load-bearing masonry walls, and around the perimeter of the building. Minimum horizontal tie reinforcement shall be not less than the equivalent of two No. 4 bars.

**2114.2.1.1 Location of horizontal ties.** Ties shall be located within the thickness of walls or beams, where they occur, or within 1 foot (305 mm) of the edge of slab, where walls or beams do not occur.

**2114.2.1.2 End connections of horizontal ties.** All horizontal ties shall be terminated in a perpendicular horizontal tie. Where no perpendicular horizontal tie exists within 4 feet (1219 mm) of the end of a wall, the horizontal tie shall be anchored at the end of the wall. The vertical reinforcement at the end of such walls shall not be less than two No. 4 bars placed within 16 inches (406 mm) of the end of the wall. This vertical reinforcement shall be continuous from the lowest to highest level of the wall, and anchored at each end in a horizontal tie or the foundation element.

**2114.2.2 End connections.** Where slab or beam elements are supported on a masonry wall, column or pier, the connection shall be designed to sustain an axial tension

capacity equal to the greater of the vertical shear capacity of the connected element at either end or 2 percent of the maximum factored vertical dead and live load in the compression masonry element. The design of the end connections shall ensure the transfer of such loads to horizontal or vertical ties.

Where more than one element frames in one direction, none of the elements or connections shall have an axial tension capacity of less than 1 percent of the vertical load.

For the design of the connections, the transverse shear force and the axial tensile force need not be considered to act simultaneously.

The reinforcement of the end connections shall be equivalent to at least one No. 4 bar, at a maximum spacing of 24 inches (610 mm) on center. Where end connections occur at a masonry pier or column, reinforcement equivalent to a minimum of four fully developed No. 4 bars shall be provided. The reinforcement shall be distributed around the perimeter of the column or pier. The minimum anchorage into both the slab and the masonry compression element shall be equivalent to the capacity of the fully developed No. 4 bar.

Where the floor extends on both sides of a bearing wall, the portion of the tie within the slab shall alternate between both sides.

**2114.2.3 Vertical ties.** Each column, pier and wall shall be vertically tied continuously from its lowest to highest level. The vertical reinforcement shall be terminated in a horizontal tie or foundation or their equivalent. Where openings in bearing walls greater than 24 inches (610 mm) in height occur, ties shall be provided at each side of the opening that extend and are anchored in the masonry above and below the opening. Vertical ties shall be placed on both sides of control joints in bearing walls.

**2114.2.3.1 Vertical ties reinforcing.** Vertical tie reinforcing shall not be less than the equivalent of one No. 4 bar, at a maximum spacing of 48 inches (1219 mm) on center. A minimum of four continuous No.4 bars shall be provided per masonry column or pier.



## CHAPTER 22

# STEEL

### SECTION BC 2201 GENERAL

**2201.1 Scope.** The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

**2201.2 Special inspection.** Steel shall be subject to the requirements of special inspection in accordance with Chapter 17.

### SECTION BC 2202 DEFINITIONS

**2202.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meaning shown herein.

**STEEL CONSTRUCTION, COLD-FORMED.** That type of construction made up entirely or in part of steel structural members cold formed to shape from sheet or strip steel such as roof deck, floor and wall panels, studs, floor joists, roof joists and other structural elements.

**STEEL JOIST.** Any steel structural member of a building or structure made of hot-rolled or cold-formed solid or open-web sections, or riveted or welded bars, strip or sheet steel members, or slotted and expanded, or otherwise deformed rolled sections.

**STEEL MEMBER, STRUCTURAL.** Any steel structural member of a building or structure consisting of a rolled steel structural shape other than cold-formed steel, or steel joist members.

### SECTION BC 2203 IDENTIFICATION AND PROTECTION OF STEEL FOR STRUCTURAL PURPOSES

**2203.1 Identification.** Identification of structural steel members shall comply with the requirements contained in AISC 360. Identification of cold-formed steel members shall comply with the requirements contained in AISI S100. Identification of cold-formed steel light-frame construction shall also comply with the requirements contained in AISI S200. Other steel furnished for structural load carrying purposes shall be properly identified for conformity to the ordered grade in accordance with the specified ASTM standard or other specification and the provisions of this chapter. Steel that is not readily identifiable as to grade from marking and test records shall be tested to determine conformity to such standards.

**2203.2 Protection.** Painting of structural steel members shall comply with the requirements contained in AISC 360. Painting of open-web steel joists and joist girders shall comply with the requirements of SJI CJ-1.0, SJI JG-1.1, SJI K-1.1 and SJI LH/DLH-1.1. Individual structural members and assembled panels of cold-formed steel construction shall be

protected against corrosion in accordance with the requirements contained in AISI S100. Protection of cold-formed steel light-frame construction shall also comply with the requirements contained in AISI S200.

### SECTION BC 2204 CONNECTIONS

**2204.1 Welding.** The details of design, workmanship and technique for welding, inspection of welding and qualification of welding operators shall conform to the requirements of the specifications listed in Sections 2205, 2206, 2207, 2209 and 2210. Special inspection of welding shall be provided where required by Section 1704.

**2204.2 Bolting.** The design, installation and inspection of bolts shall be in accordance with the requirements of the specifications listed in Sections 2205, 2206, 2209 and 2210. Special inspection of the installation of high-strength bolts shall be provided where required by Section 1704.

**2204.2.1 Anchor rods.** Anchor rods shall be set accurately to the pattern and dimensions called for on the plans. The protrusion of the threaded ends through the connected material shall be sufficient to fully engage the threads of the nuts, but shall not be greater than the length of the threads on the bolts.

### SECTION BC 2205 STRUCTURAL STEEL

**2205.1 General.** The design, fabrication and erection of structural steel for buildings and structures shall be in accordance with AISC 360. Where required, the seismic design of steel structures shall be in accordance with the additional provisions of Section 2205.2.

**2205.1.1 Structural steel.** Material for use as structural steel not listed in AISC 360 may be used in accordance with AISC 360 when approved by the commissioner for such use. Refer to Section 28-113.2.2 of the *Administrative Code* for provisions relating to approval of alternative materials.

**2205.2 Seismic requirements for steel structures.** The design of structural steel structures to resist seismic forces shall be in accordance with the provisions of Section 2205.2.1 or 2205.2.2 for the appropriate seismic design category.

**2205.2.1 Seismic Design Category A, B or C.** Structural steel structures assigned to Seismic Design Category A, B or C shall be of any construction permitted in Section 2205. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate steel system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part I. Systems not detailed in

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accordance with the above shall use the  $R$  factor in Section 12.2.1 of ASCE 7 designated for “structural steel systems not specifically detailed for seismic resistance.”

**2205.2.2 Seismic Design Category D.**† Structural steel structures assigned to Seismic Design Category D shall be designed and detailed in accordance with AISC 341, Part I.

### 2205.3 Seismic requirements for composite construction.

The design, construction and quality of composite steel and concrete components that resist seismic forces shall conform to the requirements of the AISC 360 and ACI 318. An  $R$  factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate composite† steel and concrete system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part II. In Seismic Design Category B or above, the design of such systems shall conform to the requirements of AISC 341, Part II.

**2205.3.1 Seismic Design Category D.** Composite structures are permitted in Seismic Design Category †D, subject to the limitations in Section 12.2.1 of ASCE 7, where substantiating evidence is provided to demonstrate that the proposed system will perform as intended by AISC 341, Part II. The substantiating evidence shall be subject to the commissioner’s approval. Where composite elements or connections are required to sustain inelastic deformations, the substantiating evidence shall be based on cyclic testing.

**2205.4 Reserved.**†

**2205.5 Reserved.**†

**2205.6 Fabrication, erection and quality control.** In addition to the provisions for fabrication, erection and quality control in AISC 360, the following provisions shall be used.

**2205.6.1 Shop drawings.** Shop drawings shall include the location of oversized, short slotted and long slotted holes.

**2205.6.2 Field connections.** Field connections shall meet the requirements for corresponding types of shop connections described in AISC 360. No holes, copes or cuts of any type shall be made to facilitate erection unless specifically shown on the shop drawings or authorized in writing by the engineer or architect of record.

**2205.6.3 Structural steel erection.** In addition, to the provisions of AISC 360, the requirements of Section 3305.2 shall apply.

## SECTION BC 2206 STEEL JOISTS

**2206.1 General.** The design, manufacture and use of open web steel joists and joist girders shall be in accordance with one of the following Steel Joist Institute (SJI) specifications:

1. SJI CJ-1.0
2. SJI K-1.1.
3. SJI LH/DLH-1.1.
4. SJI JG-1.1.

Where required, the seismic design of buildings shall be in accordance with the additional provisions of Section 2205.2 or 2210.5.

**2206.2 Design.** The registered design professional of record shall indicate on the construction documents the steel joist and/or steel joist girder designations from the specifications listed in Section 2206.1 and shall indicate the requirements for joist and joist girder design, layout, end supports, anchorage, non-SJI standard bridging, bridging termination connections and bearing connection design to resist uplift and lateral loads. These documents shall indicate special requirements as follows:

1. Special loads including:
  - 1.1. Concentrated loads;
  - 1.2. Nonuniform loads;
  - 1.3. Net uplift loads;
  - 1.4. Axial loads;
  - 1.5. End moments; and
  - 1.6. Connection forces.
2. Special considerations including:
  - 2.1. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girder configurations are as indicated in the SJI catalog);
  - 2.2. Oversized or other nonstandard web openings; and
  - 2.3. Extended ends.
3. Deflection criteria for live and total loads for non-SJI standard joists.

**2206.3 Calculations.** The steel joist and joist girder manufacturer shall design the steel joists and/or steel joist girders in accordance with the current SJI specifications and load tables to support the load requirements of Section 2206.2. The registered design professional of record may require submission of the steel joist and joist girder calculations as prepared by a registered design professional responsible for the product design. If requested by the registered design professional of record, the steel joist manufacturer shall submit design calculations with a cover letter bearing the seal and signature of the joist manufacturer’s registered design professional. In addition to standard calculations under this seal and signature, submittal of the following shall be included:

1. Non-SJI standard bridging details (e.g., for cantilevered conditions, net uplift, etc.).
2. Connection details for:
  - 2.1. Non-SJI standard connections (e.g., flush-framed or framed connections);
  - 2.2. Field splices; and
  - 2.3. Joist headers.

**2206.4 Steel joist drawings.** Steel joist placement plans shall be provided to show the steel joist products as specified on the construction documents and are to be utilized for field installation in accordance with specific project requirements as stated in Section 2206.2. Steel placement plans shall include, at a minimum, the following:

1. Listing of all applicable loads as stated in Section 2206.2 and used in the design of the steel joists and joist girders as specified in the construction documents.
2. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girder configurations are as indicated in the SJI catalog).
3. Connection requirements for:
  - 3.1. Joist supports;
  - 3.2. Joist girder supports;
  - 3.3. Field splices; and
  - 3.4. Bridging attachments.
4. Deflection criteria for live and total loads for non-SJI standard joists.
5. Size, location and connections for all bridging.
6. Joist headers.

**Exception:** Steel joist placement plans do not require the seal and signature of the joist manufacturer's registered design professional.

**2206.5 Certification.** At completion of manufacture, the steel joist manufacturer shall submit a certificate of compliance in accordance with Section 1704.2.2 stating that work was performed in accordance with approved construction documents and with SJI standard specifications.

**2206.6† Limitations of use.** Open web steel joists shall be prohibited in high-rise buildings until the commissioner promulgates rules establishing minimum acceptable fireproofing methods.

## SECTION BC 2207 STEEL CABLE STRUCTURES

**2207.1 General.** The design, fabrication and erection including related connections, and protective coatings of steel cables for buildings shall be in accordance with ASCE 19.

**2207.2 Seismic requirements for steel cable.** The design strength of steel cables shall be determined by the provisions of ASCE 19 except as modified by these provisions.

1. A load factor of 1.1 shall be applied to the prestress force included in  $T_3$  and  $T_4$  as defined in Section 3.12.
2. In Section 3.2.1, Item (c) shall be replaced with "1.5  $T_3$ " and Item (d) shall be replaced with "1.5  $T_4$ ".

## SECTION BC 2208 STEEL STORAGE RACKS

**2208.1 Storage racks.** The design, testing and utilization of industrial steel storage racks made of cold-formed or hot-rolled steel structural members, shall be in accordance with RMI/ANSI MH 16.1. Where required by ASCE 7, the seismic design of storage racks shall be in accordance with the provisions of Section 15.5.3 of ASCE 7, except that items (1), (2) and (3) of Section 15.5.3 of ASCE 7 do not apply when the rack design satisfies RMI/ANSI MH 16.1.

## SECTION BC 2209 COLD-FORMED STEEL

**2209.1 General.** The design of cold-formed carbon and low-alloy steel structural members shall be in accordance with AISI S100. The design of cold-formed stainless-steel structural members shall be in accordance with ASCE 8. Cold-formed steel light-frame‡ construction shall also comply with Section 2210.

**2209.2 Steel decks.** The design and construction of cold-formed steel decks shall be in accordance with this section.

**2209.2.1 Composite slabs on steel decks.** Composite slabs of concrete and steel deck shall be designed and constructed in accordance with ASCE 3.

**2209.2.2 Noncomposite steel floor decks.** Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0, as modified in Section 2209.2.2.1.

**2209.2.2.1 ANSI/SDI-NC1.0 Section 2.4B1.** Replace Section 2.4B1 of ANSI/SDI-NC1.0 with the following:

General. The design of the concrete slabs shall be done in accordance with the *ACI Building Code Requirements for Reinforced Concrete*. The minimum concrete thickness above the top of the deck shall be 1½ inches (38 mm).

**2209.2.3 Steel roof deck.** Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-RD 1.0.

## SECTION BC 2210 COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION

**2210.1 General.** The design and installation of structural members and nonstructural members utilized in cold-formed steel light-frame construction where the specified minimum base steel thickness is between 0.0179 inches (0.455 mm) and 0.1180 inches (2.997 mm) shall be in accordance with AISI S200 and Sections 2210.2 through 2210.7, as applicable.

**2210.2 Header design.** Headers, including box and back-to-back headers, and double and single L-headers shall be designed in accordance with AISI S212 or AISI S100‡.

**2210.3 Trusses.** Cold-formed steel trusses shall comply with the requirements of Sections‡ 2210.3.1 through 2210.3.5.

**2210.3.1 Design.** Cold-formed steel trusses shall be designed in accordance with AISI S214, Sections 2210.3.2 through 2210.3.5 and accepted engineering practice.

**2210.3.2 Truss design drawings.** The truss design drawings shall conform to the requirements of Section B2.3 of AISI S214 and shall be provided with the shipment of trusses delivered to the job site. The truss design drawings shall include the details of permanent individual truss member restraint/bracing in accordance with Section B6(a) or B6(c) of AISI S214 where these methods are utilized to provide restraint/bracing.

**2210.3.3 Deferred submittals.** AISI Section B4.2 shall be deleted.

**2210.3.4 Trusses spanning 60 feet or greater.** The owner shall contract with a registered design professional for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for trusses with clear spans 60 feet (18 288 mm) or greater.

**2210.3.5 Truss quality assurance.** Trusses manufactured in the fabricators plant shall be manufactured in compliance with Sections 1704.2 and 1704.3, as applicable.

**2210.4 Wall stud design.** Wall studs shall be designed in accordance with either AISI S211 or AISI S100.

**2210.5 Floor and roof system design.** Framing for floor and roof systems in buildings shall be designed in accordance with either AISI S210 or AISI S100.

**2210.6 Lateral design.** Light-frame shear walls, diagonal strap bracing that is part of a structural wall and diaphragms used to resist wind, seismic and other in-plane lateral loads shall be designed in accordance with AISI S213.

**2210.7 Prescriptive framing.** Detached one- and two-family dwellings and townhouses, less than or equal to three stories above grade plane, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein.

## SECTION BC 2211 MINIMUM THICKNESS OF METAL

**2211.1 General.** All steel of Chapter 22 shall conform to the minimum thickness of metal in accordance with Section 2211.2.

**2211.2 Exterior members.** All exterior structural steel members exposed to weather shall have a minimum thickness of metal of 0.23 inches (5.8 mm).

### Exceptions:

1. When an approved type of atmospheric corrosion-resistant steel is used.
2. Exposed surfaces are zinc coated with a minimum weight of coating of approximately 0.6 ounces per square foot (0.00156 kg/m<sup>2</sup>) of exposed surface and covered with a protective coating as required by Section 2203.2.
3. Exposed surfaces are protected by other means approved by the commissioner.
4. Temporary construction that will be in place for a period of 1 year or less, provided that all surfaces which are exposed to the weather shall have a protective coating as required by Section 2203.2.
5. Joists or purlins that are exposed to the weather but which do not support more than 200 square feet (19 m<sup>2</sup>) of floor or roof area, and which have a protective coating as required by Section 2203.2.

## SECTION BC 2212 STRUCTURAL INTEGRITY REQUIREMENTS

**2212.1 General.** Steel structures shall be designed to meet all of the requirements of this section. However, details provided for gravity, seismic and wind forces and for other pur-

poses may be regarded as forming part of, or the whole of, these requirements. Detailing provided for one requirement may be counted towards the other requirements.

### Exceptions:

1. One-story structures less than 5,000 square feet (465 m<sup>2</sup>) not to exceed 15 feet (4572 mm) in height.
2. Structures in Group R-3 occupancy not more than three stories in height.

**2212.2 Continuity and ties.** The following requirements shall be met:

1. All bolted connections shall have at least two bolts.
2. Bolted connections of all columns, beams, braces and other structural elements that are part of the lateral load resisting system shall be designed as bearing-type connections with pretensioned bolts or as slip critical connections.
3. End connections of all beams and girders shall have a minimum available tensile strength equal to the larger of the available vertical shear strength of the connections at either end, but not less than 10 kips (45 kN). For the design of the connections, the shear force and the axial tensile force need not be considered to act simultaneously. For the purpose of this provision, a connection shall be considered compliant if it meets the following requirements:
  - 3.1. For single-plate shear connections, the available tensile strength shall be determined only for the limit state of bolt bearing on the plate and beam web.
  - 3.2. For single angle and double angle shear connections, the available tensile strength shall be determined for the limit states of bolt bearing on the angles and beam web and for tension yielding on the gross area of the angles.
  - 3.3. All other connections shall be designed for the required tension force noted above in accordance with the provisions of AISC 360, or AISC-HSS.
4. For the purpose of satisfying these integrity provisions only, bearing bolts in connections with short-slotted holes parallel to the direction of the tension force and inelastic deformation are permitted. Elements and their connections that brace compression members shall have a minimum available tensile strength equal to at least 2 percent of the required compressive strength of the member being braced, but not less than 10 kips (45 kN). For design of these bracing connections, the shear force and the tensile force need not be considered to act simultaneously. Where more than one element braces a compression member at a point in one direction, all elements and connections shall have a minimum available tensile strength equal to at least 1 percent of the required compressive strength of the member being braced but not less than 10 kips (45 kN).

**2212.2.1 Vertical ties.** Column slices shall have an available tensile strength at least equal to the largest design gravity load reaction applied to the column at any floor level located within four floors below the splice.

**2212.3 Composite construction.** For steel framing members and/or decking acting compositely with concrete slabs, the following requirements shall be met:

1. Shear studs shall not be less than  $\frac{1}{2}$  inch (12.7 mm) in diameter. The spacing of shear studs shall not be greater than one every 12 inches (305 mm) averaged over the length of the beam.
2. Connections at the discontinuous edges of permanent metal decking to supporting members shall have a minimum connection strength in the direction parallel to the rib of the deck equal to the shear strength of a  $\frac{3}{4}$ -inch (19.1 mm) puddle weld every 12 inches (305 mm) on center.
3. Side lap connections of permanent metal decking shall have a minimum strength equal to the strength of a button punch every 24 inches (610 mm) on center.
4. Welded wire fabric reinforcement in concrete slabs shall be continuous over all supports and in all spans. Minimum area of continuous reinforcement shall be 0.0015 times the area of concrete. The welded wire fabric reinforcement shall have tension splices and be anchored at discontinuous edges.





## CHAPTER 23

# WOOD

### SECTION BC 2301 GENERAL

**2301.1 Scope.** The provisions of this chapter shall govern the materials, design, construction and quality of wood members and their fasteners.

**2301.2 General design requirements.** The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. Allowable stress design in accordance with Sections 2304, 2305 and 2306.
2. Load and resistance factor design in accordance with Sections 2304, 2305 and 2307.
3. Conventional light-frame construction in accordance with Sections 2304 and 2308.

**Exception:** Buildings designed in accordance with the provisions of the AF&PA WFCM shall be deemed to meet the requirements of the provisions of Section 2308.

4. The design and construction of log structures shall be in accordance with the provisions of ICC 400.

**2301.3 Nominal sizes.** For the purposes of this chapter, where dimensions of lumber are specified, they shall be deemed to be nominal dimensions unless specifically designated as actual dimensions (see Section 2304.2).

### SECTION BC 2302 DEFINITIONS

**2302.1 Definitions.** The following words and terms shall, for the purposes of this chapter, have the meanings shown herein.

**ACCREDITATION BODY.** An approved, third-party organization that is independent of the grading and inspection agencies, and the lumber mills, and that initially accredits and subsequently monitors, on a continuing basis, the competency and performance of a grading or inspection agency related to carrying out specific tasks.

**BRACED WALL LINE.** A series of braced wall panels in a single story that meets the requirements of Section 2308.3 or 2308.12.4.

**BRACED WALL PANEL.** A section of wall braced in accordance with Section 2308.9.3 or 2308.12.4.

**COLLECTOR.** A horizontal diaphragm element parallel and in line with the applied force that collects and transfers diaphragm shear forces to the vertical elements of the lateral-force-resisting system and/or distributes forces within the diaphragm.

**CONVENTIONAL LIGHT-FRAME CONSTRUCTION.** A type of construction whose primary structural elements are formed by a system of repetitive wood-framing

members. See Section 2308 for conventional light-frame construction provisions.

**CRIPPLE WALL.** A framed stud wall extending from the top of the foundation to the underside of floor framing for the lowest occupied floor level.

**DIAPHRAGM, UNBLOCKED.** A diaphragm that has edge nailing at supporting members only. Blocking between supporting structural members at panel edges is not included. Diaphragm panels are field nailed to supporting members.

**DRAG STRUT.** See "Collector."

**FIBERBOARD.** A fibrous, homogeneous panel made from lignocellulosic fibers (usually wood or cane) and having a density of less than 31 pounds per cubic foot (pcf) (497 kg/m<sup>3</sup>) but more than 10 pcf (160 kg/m<sup>3</sup>).

**FIRECUT.** A sloping cut on the ends of wood beams, joists and rafters resting on masonry or concrete walls.

**GLUED BUILT-UP MEMBER.** A structural element, the section of which is composed of built-up lumber, wood structural panels or wood structural panels in combination with lumber, all parts bonded together with structural adhesives.

**GRADE (LUMBER).** The classification of lumber in regard to strength and utility in accordance with American Softwood Lumber Standard DOC PS 20 and the grading rules of an approved lumber rules-writing agency.

**HARDBOARD.** A fibrous-felted, homogeneous panel made from lignocellulosic fibers consolidated under heat and pressure in a hot press to a density not less than 31 pcf (497 kg/m<sup>3</sup>).

**NAILING, BOUNDARY.** A special nailing pattern required by design at the boundaries of diaphragms.

**NAILING, EDGE.** A special nailing pattern required by design at the edges of each panel within the assembly of a diaphragm or shear wall.

**NAILING, FIELD.** Nailing required between the sheathing panels and framing members at locations other than boundary nailing and edge nailing.

**NATURALLY DURABLE WOOD.** The heartwood of the following species, with the exception that an occasional piece with corner sapwood is permitted if 90 percent or more of the width of each side on which it occurs is heartwood:

**Decay resistant.** Redwood, cedar, black locust and black walnut.

**Termite resistant.** Redwood, Alaska yellow-cedar, Eastern red cedar and both heartwood and all sapwood of Western red cedar.

**NOMINAL SIZE (LUMBER).** The commercial size designation of width and depth, in standard sawn lumber and glued-laminated lumber grades; somewhat larger than the

standard net size of dressed lumber, in accordance with DOC PS 20 for sawn lumber and with the AF&PA NDS for glued-laminated lumber.

**PARTICLEBOARD.** A generic term for a panel primarily composed of cellulosic materials (usually wood), generally in the form of discrete pieces or particles, as distinguished from fibers. The cellulosic material is combined with synthetic resin or other suitable bonding system by a process in which the interparticle bond is created by the bonding system under heat and pressure.

**PREFABRICATED WOOD I-JOIST.** Structural member manufactured using sawn or structural composite lumber flanges and wood structural panel webs bonded together with exterior exposure adhesives, which forms an “I” cross-sectional shape.

**SHEAR WALL.** A wall designed to resist lateral forces parallel to the plane of a wall.

**Shear wall, perforated.** A wood structural panel sheathed wall with openings, that has not been specifically designed and detailed for force transfer around openings.

**Shear wall segment, perforated.** A section of shear wall with full-height sheathing that meets the height-to-width ratio limits of Section 4.3.4 of AF&PA SDPWS.

**STRUCTURAL COMPOSITE LUMBER.** Structural member manufactured using wood elements bonded together with exterior adhesives. Examples of structural composite lumber are:

**Laminated veneer lumber (LVL).** A composite of wood veneer sheet elements with wood fibers primarily oriented along the length of the member.

**Parallel strand lumber (PSL).** A composite of wood strand elements with wood fibers primarily oriented along the length of the member.

**STRUCTURAL GLUED-LAMINATED TIMBER.** An engineered, stress-rated product of a timber laminating plant, comprised of assemblies of specially selected and prepared wood laminations in which the grain of all laminations is approximately parallel longitudinally and the laminations are bonded with adhesives.

**SUBDIAPHRAGM.** A portion of a larger wood diaphragm designed to anchor and transfer local forces to primary diaphragm struts and the main diaphragm.

**TIE-DOWN (HOLD-DOWN).** A device used to resist uplift of the chords of shear walls.

**TREATED WOOD.** Wood and wood-based materials that use vacuum-pressure impregnation processes to enhance fire retardant or preservative properties.

**Fire-retardant-treated wood.** Pressure-treated lumber and plywood that exhibit reduced surface-burning characteristics and resist propagation of fire.

**Preservative-treated wood.** Pressure-treated wood products that exhibit reduced susceptibility to damage by fungi, insects or marine borers.

**WOOD SHEAR PANEL.** A wood floor, roof or wall component sheathed to act as a shear wall or diaphragm.

**WOOD STRUCTURAL PANEL.** A panel manufactured from veneers, wood strands or wafers or a combination of veneer and wood strands or wafers bonded together with waterproof synthetic resins or other suitable bonding systems. Examples of wood structural panels are:

**Composite panels.** A wood structural panel that is comprised of wood veneer and reconstituted wood-based material and bonded together with waterproof adhesive;

**Oriented strand board (OSB).** A mat-formed wood structural panel comprised of thin rectangular wood strands arranged in cross-aligned layers with surface layers normally arranged in the long panel direction and bonded with waterproof adhesive; or

**Plywood.** A wood structural panel comprised of plies of wood veneer arranged in cross-aligned layers. The plies are bonded with waterproof adhesive that cures on application of heat and pressure.

## SECTION BC 2303 MINIMUM STANDARDS AND QUALITY

**2303.1 General.** Structural sawn lumber; end-jointed lumber prefabricated wood I-joists; structural glued-laminated timber; wood structural panels, fiberboard sheathing (when used structurally); hardboard siding (when used structurally); particleboard; preservative-treated wood; structural log members; structural composite lumber; round timber poles and piles; fire-retardant-treated wood; hardwood plywood; wood trusses; joist hangers; nails; and staples shall conform to the applicable provisions of this section.

**2303.1.1 Sawn lumber.** Sawn lumber used for load-supporting purposes, including end-jointed or edge-glued lumber, machine stress-rated or machine-evaluated lumber, shall be identified by the grade mark of a lumber grading or inspection agency that has been approved by the commissioner that complies with DOC PS 20 or equivalent. Grading practices and identification shall comply with rules published by an agency approved in accordance with the procedures of DOC PS 20 or equivalent procedures. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by a lumber grading or inspection agency meeting the requirements of this section is permitted to be accepted for pre-cut, remanufactured or rough-sawn lumber and for sizes larger than 3 inches (76 mm) nominal thickness. Approved end-jointed lumber is permitted to be used interchangeably with solid-sawn members of the same species and grade.

**2303.1.2 Prefabricated wood I-joists.** Structural capacities and design provisions for prefabricated wood I-joists shall be established and monitored in accordance with ASTM D 5055. The use of prefabricated wood I-joists structurally shall be subject to the special inspection requirements of Chapter 17.

**2303.1.3 Structural glued-laminated timber.** Glued-laminated timbers shall be manufactured and identified as required in ANSI/AITC A 190.1 and ASTM D 3737.

**2303.1.4 Wood structural panels.** Wood structural panels, when used structurally (including those used for siding, roof and wall sheathing, subflooring, diaphragms and built-up members), shall conform to the requirements for their type in DOC PS 1 or PS 2. Each panel or member shall be identified for grade and glue type by the trademarks of an approved testing and grading agency. Wood structural panel components shall be designed and fabricated in accordance with the applicable standards listed in Section 2306.1 and identified by the trademarks of an approved testing and inspection agency indicating conformance with the applicable standard. In addition, wood structural panels when permanently exposed in outdoor applications shall be of exterior type, except that wood structural panel roof sheathing exposed to the outdoors on the underside is permitted to be interior type bonded with exterior glue, Exposure 1.

**2303.1.5 Fiberboard.** Fiberboard for its various uses shall conform to ASTM C 208. Fiberboard sheathing, when used structurally, shall be identified by an approved agency as conforming to ASTM C 208.

**2303.1.5.1 Jointing.** To ensure tight-fitting assemblies, edges shall be manufactured with square, shiplapped, beveled, tongue-and-groove or U-shaped joints.

**2303.1.5.2 Roof insulation.** Where used as roof insulation in all types of construction, fiberboard shall be protected with an approved roof covering.

**2303.1.5.3 Wall insulation.** Where installed and fire-blocked to comply with Chapter 7, fiberboards are permitted as wall insulation in all types of construction. In fire walls and fire barriers, unless treated to comply with Section 803.1 for Class A materials, the boards shall be cemented directly to the concrete, masonry or other noncombustible base and shall be protected with an approved noncombustible veneer anchored to the base without intervening airspaces.

**2303.1.5.3.1 Protection.** Fiberboard wall insulation applied on the exterior of foundation walls shall be protected below ground level with a bituminous coating.

**2303.1.6 Hardboard.** Hardboard siding used structurally shall be identified by an approved agency conforming to CPA/ANSI A135.6. Hardboard underlayment shall meet the strength requirements of  $\frac{7}{32}$ -inch (5.6 mm) or  $\frac{1}{4}$ -inch (6.4 mm) service class hardboard planed or sanded on one side to a uniform thickness of not less than 0.200 inch (5.1 mm). Prefinished hardboard paneling shall meet the requirements of CPA/ANSI A 135.5. Other basic hardboard products shall meet the requirements of CPA/ANSI A135.4. Hardboard products shall be installed in accordance with manufacturer's recommendations.

**2303.1.7 Particleboard.** Particleboard shall conform to ANSI A208.1. Particleboard shall be identified by the grade mark or certificate of inspection issued by an

approved agency. Particleboard shall not be utilized for applications other than indicated in this section unless the particleboard complies with the provisions of Section 2306.5.

**2303.1.7.1 Floor underlayment.** Particleboard floor underlayment shall conform to Type PBU of ANSI A208.1. Type PBU underlayment shall not be less than  $\frac{1}{4}$ -inch (6.4 mm) thick and shall be installed in accordance with the instructions of the Composite Panel Association.

**2303.1.8 Preservative-treated wood.** Lumber, timber, plywood, piles and poles supporting permanent structures required by Section 2304.11 to be preservative treated shall conform to the requirements of the applicable AWWA Standard U1 and M4 for the species, product, preservative and end use. Preservatives shall be listed in Section 4 of AWWA U1. Lumber and plywood used in wood foundation systems shall conform to Chapter 18.

**2303.1.8.1 Identification.** Wood required by Section 2304.11 to be preservative treated shall bear the quality mark of an inspection agency that maintains continuing supervision, testing and inspection over the quality of the preservative-treated wood. Inspection agencies for preservative-treated wood shall be listed by an accreditation body that complies with the requirements of the American Lumber Standards Treated Wood Program, or its equivalent. The quality mark shall be on a stamp or label affixed to the preservative-treated wood, and shall include the following information:

1. Identification of treating manufacturer.
2. Type of preservative used.
3. Minimum preservative retention (pcf).
4. End use for which the product is treated.
5. AWWA standard to which the product was treated.
6. Identity of the accredited inspection agency.

**2303.1.8.2 Moisture content.** Where preservative-treated wood is used in enclosed locations where drying in service cannot readily occur, such wood shall be at a moisture content of 19 percent or less before being covered with insulation, interior wall finish, floor covering or other materials.

**2303.1.9 Structural composite lumber.** Structural capacities for structural composite lumber shall be established and monitored in accordance with ASTM D 5456.

**2303.1.10 Structural log members.** Stress grading of structural log members of nonrectangular shape, as typically used in log buildings, shall be in accordance with ASTM D 3957. Such structural log members shall be identified by the grade mark of an approved lumber grading or inspection agency. In lieu of a grade mark on the material, a certificate of inspection as to species and grade issued by an approved lumber grading or inspection agency shall be permitted.



**2303.1.11 Round timber poles and piles.** Round timber poles and piles shall comply with ASTM D 3200 and ASTM D 25, respectively.

**2303.2 Fire-retardant-treated wood.** Fire-retardant-treated wood is any wood product which, when impregnated with chemicals by a pressure process or other means during manufacture, shall have, when tested in accordance with ASTM E 84 or UL 723, a listed flame spread index of 25 or less and show no evidence of significant progressive combustion when the test is continued for an additional 20-minute period. Additionally, the flame front shall not progress more than 10½ feet (3200 mm) beyond the centerline of the burners at any time during the test.

**2303.2.1 Pressure process.** For wood products impregnated with chemicals by a pressure process, the process shall be performed in closed vessels under pressures not less than 50 pounds per square inch gauge (psig) (345 kPa).

**2303.2.2 Other means during manufacture.** For wood products produced by other means during manufacture, the treatment shall be an integral part of the manufacturing process of the wood product. The treatment shall provide permanent protection to all surfaces of the wood product.

**2303.2.3 Testing.** For wood products produced by other means during manufacture, other than a pressure process, all sides of the wood product shall be tested in accordance with and produce the results required in Section 2303.2. Wood structural panels shall be permitted to be tested on only the front and back faces.

**2303.2.4 Labeling.** Fire-retardant-treated lumber and wood structural panels shall be labeled. The label shall contain the following items:

1. The identification mark of an approved agency in accordance with Chapter 1 of Title 28 of the *Administrative Code*;
2. Identification of the treating manufacturer;
3. The name of the fire-retardant treatment;
4. The species of wood treated;
5. Flame spread and smoke-developed index;
6. Method of drying after treatment;
7. Conformance with appropriate standards in accordance with Sections 2303.2.2 through 2303.2.5; and
8. For fire-retardant-treated wood exposed to weather, damp or wet locations, include the words "No increase in the listed classification when subjected to the Standard Rain Test" (ASTM D 2898).

**2303.2.5 Strength adjustments.** Design values for untreated lumber and wood structural panels, as specified in Section 2303.1, shall be adjusted for fire-retardant-treated wood. Adjustments to design values shall be based on an approved method of investigation that takes into consideration the effects of the anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and redrying procedures.

**2303.2.5.1 Wood structural panels.** The effect of treatment and the method of redrying after treatment, and exposure to high temperatures and high humidities on the flexure properties of fire-retardant-treated softwood plywood shall be determined in accordance with ASTM D 5516. The test data developed by ASTM D 5516 shall be used to develop adjustment factors, maximum loads and spans, or both, for untreated plywood design values in accordance with ASTM D 6305. Each manufacturer shall publish the allowable maximum loads and spans for service as floor and roof sheathing for its treatment.

**2303.2.5.2 Lumber.** For each species of wood that is treated, the effects of the treatment, the method of redrying after treatment and exposure to high temperatures and high humidities on the allowable design properties of fire-retardant-treated lumber shall be determined in accordance with ASTM D 5664. The test data developed by ASTM D 5664 shall be used to develop modification factors for use at or near room temperature and at elevated temperatures and humidity in accordance with ASTM D 6841. Each manufacturer shall publish the modification factors for service at temperatures of not less than 80°F (27°C) and for roof framing. The roof framing modification factors shall take into consideration the climatological location.

**2303.2.6 Exposure to weather, damp or wet locations.** Where fire-retardant-treated wood is exposed to weather, or damp or wet locations, it shall be identified as "Exterior" to indicate there is no increase in the listed flame spread index as defined in Section 2303.2 when subjected to ASTM D 2898.

**2303.2.7 Interior applications.** Interior fire-retardant-treated wood shall have moisture content of not over 28 percent when tested in accordance with ASTM D 3201 procedures at 92-percent relative humidity. Interior fire-retardant-treated wood shall be tested in accordance with Section 2303.2.5.1 or 2303.2.5.2. Interior fire-retardant-treated wood designated as Type A shall be tested in accordance with the provisions of this section.

**2303.2.8 Moisture content.** Fire-retardant-treated wood shall be dried to a moisture content of 19 percent or less for lumber and 15 percent or less for wood structural panels before use. For wood kiln dried after treatment (KDAT), the kiln temperatures shall not exceed those used in kiln drying the lumber and plywood submitted for the tests described in Section 2303.2.5.1 for plywood and 2303.2.5.2 for lumber.

**2303.2.9 Type I and II construction applications.** See Section 603.1 for limitations on the use of fire-retardant-treated wood in buildings of Type I or II construction.

**2303.3 Hardwood and plywood.** Hardwood and decorative plywood shall be manufactured and identified as required in HPVA HP-1.

**2303.4 Trusses.**

**2303.4.1 Design.** Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other approved framing devices. Metal-plate-connected wood trusses shall also be subject to the special inspection requirements of Chapter 17.

**2303.4.1.1 Truss design drawings.** Truss construction documents shall be prepared by a registered design professional and the written, graphic and pictorial depiction of each individual truss shall be provided to the commissioner and approved prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of all joints and support locations;
3. Number of plies, if greater than one;
4. Required bearing widths;
5. Design loads as applicable, including:
  - 5.1. Top chord live load;
  - 5.2. Top chord dead load;
  - 5.3. Bottom chord live load;
  - 5.4. Bottom chord dead load;
  - 5.5. Additional loads and locations; and
  - 5.6. Environmental design criteria and loads (wind, rain, snow, seismic, *etc.*).
6. Other lateral loads, including drag strut loads;
7. Adjustments to wood member and metal connector plate design value for conditions of use;
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable;
9. Metal-connector-plate type, size and thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
10. Size, species and grade for each wood member;
11. Truss-to-truss connections and truss field assembly requirements;
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
13. Maximum axial tension and compression forces in the truss members;
14. Required permanent individual truss member restraint location and the method and details of restraint/bracing to be used in accordance with Section 2303.4.1.2; and

15. Required temporary individual and system truss member restraint/bracing requirements for safe handling and field assembly.

**2303.4.1.2 Permanent individual truss member restraint.** Where permanent restraint of truss members is required on the truss design drawings, it shall be accomplished by one of the following methods:

1. Permanent individual truss member restraint/bracing shall be installed using standard industry lateral restraint/bracing details in accordance with generally accepted engineering practice. Locations for lateral restraint shall be identified on the truss design drawing.
2. The trusses shall be designed so that the buckling of any individual truss member is resisted internally by the individual truss through suitable means (i.e., buckling reinforcement by T-reinforcement or L-reinforcement, proprietary reinforcement, *etc.*). The buckling reinforcement of individual members of the trusses shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement details provided by the truss designer.
3. A project-specific permanent individual truss member restraint/bracing design shall be permitted to be specified by any registered design professional.

**2303.4.1.3 Trusses spanning 60 feet or greater.** The owner shall contract with any qualified registered design professional for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for all trusses with clear spans 60 feet (18 288 mm) or greater.

**2303.4.1.4 Truss designer.** The individual or organization responsible for the design of trusses.

**2303.4.1.4.1 Truss design drawings.** Each individual truss design drawing shall bear the seal and signature of the truss designer.

**Exceptions:**

1. Where a cover sheet and truss index sheet are combined into a single sheet and attached to the set of truss design drawings, the single cover/truss index sheet is the only document required to be signed and sealed by the truss designer.
2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings, the cover sheet and the truss index sheet are the only documents required to be signed and sealed by the truss designer.

**2303.4.2 Truss placement diagram.** The truss manufacturer shall provide a truss placement diagram that identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part

of the truss submittal package, and with the shipment of trusses delivered to the job site. Truss placement diagrams that serve only as a guide for installation and do not deviate from the Truss Designer's approved construction drawings shall not be required to bear the seal or signature of the truss designer.

**2303.4.3 Truss submittal package.** The truss submittal package provided by the truss manufacturer shall consist of: each individual truss design drawing; the truss placement diagram; the permanent individual truss member restraint/bracing method and details and any other structural details germane to the trusses; and, as applicable, the cover/truss index sheet.

**2303.4.4 Anchorage.** The design for the transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the registered design professional.

**2303.4.5 Alterations to trusses.** Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a registered design professional. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, piping, additional roofing or insulation, etc.) shall not be permitted without verification that the truss is capable of supporting such additional loading.

**2303.4.6 TPI 1 specifications.** In addition to Sections 2303.4.1 through 2303.4.5, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Job-site inspections shall be in compliance with Section 110.4, as applicable.

**2303.4.7 Truss quality assurance.** Trusses not part of a manufacturing process in accordance with either Section 2303.4.6 or a standard listed in Chapter 35, which provides requirements for quality control done under the supervision of a third-party quality control agency, shall be manufactured in compliance with Sections 1704.2 and 1704.6, as applicable.

**2303.5 Test standard for joist hangers and connectors.** For the required test standards for joist hangers and connectors, see Section 1716.1.

**2303.6 Nails and staples.** Nails and staples shall conform to requirements of ASTM F 1667. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as follows: 80 kips per square inch (ksi) (551 MPa) for shank diameters larger than 0.177 inch (4.50 mm) but not larger than 0.254 inch (6.45 mm), 90 ksi (620 MPa) for shank diameters larger than 0.142 inch (3.61 mm) but not larger than 0.177 inch (4.50 mm) and 100 ksi (689 MPa) for shank diameters of at least 0.099 inch (2.51 mm) but not larger than 0.142 inch (3.61 mm).

**2303.7 Shrinkage.** Consideration shall be given in design to the possible effect of cross-grain dimensional changes considered vertically which may occur in lumber fabricated in a green condition.

## SECTION BC 2304 GENERAL CONSTRUCTION REQUIREMENTS

**2304.1 General.** The provisions of this section apply to design methods specified in Section 2301.2.

**2304.2 Size of structural members.** Computations to determine the required sizes of members shall be based on the net dimensions (actual sizes) and not nominal sizes.

**2304.3 Wall framing.** The framing of exterior and interior walls shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

**2304.3.1 Bottom plates.** Studs shall have full bearing on a 2-inch-thick (actual 1½-inch, 38 mm) or larger plate or sill having a width at least equal to the width of the studs.

**2304.3.2 Framing over openings.** Headers, double joists, trusses or other approved assemblies that are of adequate size to transfer loads to the vertical members shall be provided over window and door openings in load-bearing walls and partitions.

**2304.3.3 Shrinkage.** Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the commissioner shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems, or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall also show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

**2304.4 Floor and roof framing.** The framing of wood-joisted floors and wood framed roofs shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

**2304.5 Framing around flues and chimneys.** Combustible framing shall be a minimum of 2 inches (51 mm), but shall not be less than the distance specified in Sections 2111 and 2113 and the *New York City Mechanical Code*, from flues, chimneys and fireplaces, and 6 inches (152 mm) away from flue openings.

**2304.6 Wall sheathing.** Except as provided for in Section 1405 for weatherboarding or where stucco construction that complies with Section 2510 is installed, enclosed buildings shall be sheathed with one of the materials of the nominal thickness specified in Table 2304.6 or any other approved material of equivalent strength or durability.

**2304.6.1 Wood structural panel sheathing.** Where wood structural panel sheathing is used as the exposed finish on the exterior of outside walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior). Wood structural panel wall sheathing or siding used as structural sheathing shall be capable of resisting wind pressures in accordance with Section 1609. Maximum wind speeds for wood struc-

**TABLE 2304.6**  
**MINIMUM THICKNESS OF WALL SHEATHING**

SHEATHING TYPE	MINIMUM THICKNESS	MAXIMUM WALL STUD SPACING
Wood boards	$\frac{5}{8}$ inch	24 inches on center
Fiberboard	$\frac{1}{2}$ inch	16 inches on center
Wood structural panel	In accordance with Tables 2308.9.3(2) and 2308.9.3(3)	—
M-S “Exterior Glue” and M-2 “Exterior Glue” Particleboard	In accordance with Section 2306.3 and Table 2308.9.3(4)	—
Gypsum sheathing	$\frac{1}{2}$ inch	16 inches on center
Gypsum wallboard	$\frac{1}{2}$ inch	24 inches on center
Reinforced cement mortar	1 inch	24 inches on center

For SI: 1 inch = 25.4 mm.

**TABLE 2304.6.1**  
**MAXIMUM NOMINAL DESIGN WIND SPEED, (MPH) (3-SECOND GUST) PERMITTED FOR**  
**WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES<sup>a, b, c</sup>**

MINIMUM NAIL		MINIMUM WOOD STRUCTURAL PANEL SPAN RATING	MINIMUM NOMINAL PANEL THICKNESS (inches)	MAXIMUM WALL STUD SPACING (inches)	PANEL NAIL SPACING		MAXIMUM NOMINAL DESIGN WIND SPEED, (MPH)		
Size	Penetration (inches)				Edges (inches o.c.)	Field (inches o.c.)	Wind exposure category		
							B	C	D
6d common (2.0" × 0.113")	1.5	24/0	<sup>3</sup> / <sub>8</sub>	16	6	12	110	90	85
		24/16	<sup>7</sup> / <sub>16</sub>	16	6	12	110	100	90
						6	150	125	110
8d common (2.5" × 0.131")	1.75	24/16	<sup>7</sup> / <sub>16</sub>	16	6	12	130	110	105
						6	150	125	110
				24	6	12	110	90	85
						6	110	90	85

For SI: 1 inch = 25.4 mm, 1 mile per hour = 0.447 m/s.

- Panel strength axis shall be parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.
- The table is based on wind pressures acting toward and away from building surfaces in accordance with Section 30.7 of ASCE 7. Lateral requirements shall be in accordance with Section 2305 or 2308.
- Wood structural panels with span ratings of wall-16 or wall-24 shall be permitted as an alternative to panels with a 24/0 span rating. Plywood siding rated 16 o.c. or 24 o.c. shall be permitted as an alternative to panels with a 24/16 span rating. Wall-16 and plywood siding 16 o.c. shall be used with studs spaced a maximum of 16 inches o.c.

tural panel sheathing used to resist wind pressures shall be in accordance with Table 2304.6.1 for enclosed buildings with a mean roof height not greater than 30 feet (9144 mm), an importance factor (*I*) of 1.0 and a topographic factor (*K<sub>zt</sub>*) of 1.0.

**2304.6.2 Interior paneling.** Softwood wood structural panels used for interior paneling shall conform to the provisions of Chapter 8 and shall be installed in accordance with Table 2304.9.1. Panels shall comply with DOC PS 1 or PS2. Prefinished hardboard paneling shall meet the requirements of CPA/ANSI A135.5. Hardwood plywood shall conform to HPVA HP-1.

#### **2304.7 Floor and roof sheathing.**

**2304.7.1 Structural floor sheathing.** Structural floor sheathing shall be designed in accordance with the general provisions of this code and the special provisions in this section. Floor sheathing conforming to the provisions of Table 2304.7(1), 2304.7(2), 2304.7(3) or 2304.7(4) shall be deemed to meet the requirements of this section.

**2304.7.2 Structural roof sheathing.** Structural roof sheathing shall be designed in accordance with the general

provisions of this code and the special provisions in this section. Roof sheathing conforming to the provisions of Table 2304.7(1), 2304.7(2), 2304.7(3) or 2304.7(5) shall be deemed to meet the requirements of this section. Wood structural panel roof sheathing shall be bonded by exterior glue.

#### **2304.8 Lumber decking.**

**2304.8.1 General.** Lumber decking shall be designed and installed in accordance with the general provisions of this code and Section 2304.8. Each piece shall be square end trimmed. When random lengths are furnished, each piece shall be square end trimmed across the face so that at least 90 percent of the pieces are within 0.5 degrees (0.00873 rad) of square. The ends of the pieces shall be permitted to be beveled up to 2 degrees (0.0349 rad) from the vertical with the exposed face of the piece slightly longer than the opposite face of the piece. Tongue-and-groove decking shall be installed with the tongues up on sloped or pitched roofs with pattern faces down.

**2304.8.2 Layup patterns.** Lumber decking is permitted to be laid up following one of five standard patterns as defined in Sections 2304.8.2.1 through 2304.8.2.5.



**TABLE 2304.7(1)**  
**ALLOWABLE SPANS FOR LUMBER FLOOR AND ROOF SHEATHING<sup>a, b</sup>**

SPAN (inches)	MINIMUM NET THICKNESS (inches) OF LUMBER PLACED			
	Perpendicular to supports		Diagonally to supports	
	Surfaced dry <sup>c</sup>	Surfaced unseasoned	Surfaced dry <sup>c</sup>	Surfaced unseasoned
<b>Floors</b>				
24	$\frac{3}{4}$	$\frac{25}{32}$	$\frac{3}{4}$	$\frac{25}{32}$
16	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{5}{8}$	$\frac{11}{16}$
<b>Roofs</b>				
24	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{25}{32}$

For SI: 1 inch = 25.4 mm.

a. Installation details shall conform to Sections 2304.7.1 and 2304.7.2 for floor and roof sheathing, respectively.

b. Floor or roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.7.

c. Maximum 19-percent moisture content.

**TABLE 2304.7(2)**  
**SHEATHING LUMBER, MINIMUM GRADE REQUIREMENTS: BOARD GRADE**

SOLID FLOOR OR ROOF SHEATHING	SPACED ROOF SHEATHING	GRADING RULES
Utility	Standard	NLGA, WCLIB, WWP
4 common or utility	3 common or standard	NLGA, WCLIB, WWP, NSLB or NELMA
No. 3	No. 2	SPIB
Merchantable	Construction common	RIS

**TABLE 2304.7(3)**  
**ALLOWABLE SPANS AND LOADS FOR WOOD STRUCTURAL PANEL SHEATHING AND SINGLE-FLOOR GRADES CONTINUOUS OVER TWO OR MORE SPANS WITH STRENGTH AXIS PERPENDICULAR TO SUPPORTS<sup>a, b</sup>**

SHEATHING GRADES		ROOF <sup>c</sup>				FLOOR <sup>d</sup>
Panel span rating roof/floor span	Panel thickness (inches)	Maximum span (inches)		Load <sup>e</sup> (psf)		Maximum span (inches)
		With edge support <sup>f</sup>	Without edge support	Total load	Live load	
16/0	$\frac{3}{8}$	16	16	40	30	0
20/0	$\frac{3}{8}$	20	20	40	30	0
24/0	$\frac{3}{8}, \frac{7}{16}, \frac{1}{2}$	24	20 <sup>g</sup>	40	30	0
24/16	$\frac{7}{16}, \frac{1}{2}$	24	24	50	40	16
32/16	$\frac{15}{32}, \frac{1}{2}, \frac{5}{8}$	32	28	40	30	16 <sup>h</sup>
40/20	$\frac{19}{32}, \frac{5}{8}, \frac{3}{4}, \frac{7}{8}$	40	32	40	30	20 <sup>h,i</sup>
48/24	$\frac{23}{32}, \frac{3}{4}, \frac{7}{8}$	48	36	45	35	24
54/32	$\frac{7}{8}, 1$	54	40	45	35	32
60/32	$\frac{7}{8}, 1\frac{1}{8}$	60	48	45	35	32
SINGLE FLOOR GRADES		ROOF <sup>c</sup>				FLOOR <sup>d</sup>
Panel span rating	Panel thickness (inches)	Maximum span (inches)		Load <sup>e</sup> (psf)		Maximum span (inches)
		With edge support <sup>f</sup>	Without edge support	Total load	Live load	
16 o.c.	$\frac{1}{2}, \frac{19}{32}, \frac{5}{8}$	24	24	50	40	16 <sup>h</sup>
20 o.c.	$\frac{19}{32}, \frac{5}{8}, \frac{3}{4}$	32	32	40	30	20 <sup>h,i</sup>
24 o.c.	$\frac{23}{32}, \frac{3}{4}$	48	36	35	25	24
32 o.c.	$\frac{7}{8}, 1$	48	40	50	40	32
48 o.c.	$1\frac{3}{32}, 1\frac{1}{8}$	60	48	50	40	48

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

a. Applies to panels 24 inches or wider.

b. Floor and roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.7.

c. Uniform load deflection limitations  $\frac{1}{180}$  of span under live load plus dead load,  $\frac{1}{240}$  under live load only.

d. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking unless  $\frac{1}{4}$ -inch minimum thickness underlayment or  $1\frac{1}{2}$  inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is  $\frac{3}{4}$ -inch wood strip. Allowable uniform load based on deflection of  $\frac{1}{360}$  of span is 100 pounds per square foot except the span rating of 48 inches on center is based on a total load of 65 pounds per square foot.

e. Allowable load at maximum span.

f. Tongue-and-groove edges, panel edge clips (one midway between each support, except two equally spaced between supports 48 inches on center), lumber blocking or other. Only lumber blocking shall satisfy blocked diaphragm requirements.

g. For  $\frac{1}{2}$ -inch panel, maximum span shall be 24 inches.

h. Span is permitted to be 24 inches on center where  $\frac{3}{4}$ -inch wood strip flooring is installed at right angles to joist.

i. Span is permitted to be 24 inches on center for floors where  $1\frac{1}{2}$  inches of cellular or lightweight concrete is applied over the panels.

**TABLE 2304.7(4)**  
**ALLOWABLE SPAN FOR WOOD STRUCTURAL PANEL COMBINATION SUBFLOOR-UNDERLAYMENT (SINGLE FLOOR)<sup>a, b</sup>**  
**(Panels Continuous Over Two or More Spans and Strength Axis Perpendicular to Supports)**

IDENTIFICATION	MAXIMUM SPACING OF JOISTS (inches)				
	16	20	24	32	48
Species group <sup>c</sup>	Thickness (inches)				
1	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	—	—
2, 3	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	—	—
4	$\frac{3}{4}$	$\frac{7}{8}$	1	—	—
Single floor span rating <sup>d</sup>	16 o.c.	20 o.c.	24 o.c.	32 o.c.	48 o.c.

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. Spans limited to value shown because of possible effects of concentrated loads. Allowable uniform loads based on deflection of  $\frac{1}{360}$  of span is 100 pounds per square foot except allowable total uniform load for  $\frac{1}{8}$ -inch wood structural panels over joists spaced 48 inches on center is 65 pounds per square foot. Panel edges shall have approved tongue-and-groove joints or shall be supported with blocking, unless  $\frac{1}{4}$ -inch minimum thickness underlayment or  $\frac{1}{2}$  inches of approved cellular or lightweight concrete is placed over the subfloor, or finish floor is  $\frac{3}{4}$ -inch wood strip.
- b. Floor panels conforming with this table shall be deemed to meet the design criteria of Section 2304.7.
- c. Applicable to all grades of sanded exterior-type plywood. See DOC PS 1 for plywood species groups.
- d. Applicable to Underlayment grade, C-C (Plugged) plywood, and Single Floor grade wood structural panels.

**TABLE 2304.7(5)**  
**ALLOWABLE LOAD (PSF) FOR WOOD STRUCTURAL PANEL ROOF SHEATHING CONTINUOUS**  
**OVER TWO OR MORE SPANS AND STRENGTH AXIS PARALLEL TO SUPPORTS**  
**(Plywood Structural Panels Are Five-Ply, Five-Layer Unless Otherwise Noted)<sup>a, b</sup>**

PANEL GRADE	THICKNESS (inch)	MAXIMUM SPAN (inches)	LOAD AT MAXIMUM SPAN (psf)	
			Live	Total
Structural I sheathing	$\frac{7}{16}$	24	20	30
	$\frac{15}{32}$	24	35 <sup>c</sup>	45 <sup>c</sup>
	$\frac{1}{2}$	24	40 <sup>c</sup>	50 <sup>c</sup>
	$\frac{19}{32}, \frac{5}{8}$	24	70	80
	$\frac{23}{32}, \frac{3}{4}$	24	90	100
Sheathing, other grades covered in DOC PS 1 or DOC PS 2	$\frac{7}{16}$	16	40	50
	$\frac{15}{32}$	24	20	25
	$\frac{1}{2}$	24	25	30
	$\frac{19}{32}$	24	40 <sup>c</sup>	50 <sup>c</sup>
	$\frac{5}{8}$	24	45 <sup>c</sup>	55 <sup>c</sup>
	$\frac{23}{32}, \frac{3}{4}$	24	60 <sup>c</sup>	65 <sup>c</sup>

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>.

- a. Roof sheathing conforming with this table shall be deemed to meet the design criteria of Section 2304.7.
- b. Uniform load deflection limitations  $\frac{1}{180}$  of span under live load plus dead load,  $\frac{1}{240}$  under live load only. Edges shall be blocked with lumber or other approved type of edge supports.
- c. For composite and four-ply plywood structural panel, load shall be reduced by 15 pounds per square foot.

Other patterns are permitted to be used provided they are substantiated through engineering analysis.

**2304.8.2.1 Simple span pattern.** All pieces shall be supported on their ends (i.e., by two supports).

**2304.8.2.2 Two-span continuous pattern.** All pieces shall be supported by three supports, and all end joints shall occur in line on alternating supports. Supporting members shall be designed to accommodate the load redistribution caused by this pattern.

**2304.8.2.3 Combination simple and two-span continuous pattern.** Courses in end spans shall be alternating simple-span pattern and two-span continuous pattern. End joints shall be staggered in adjacent courses and shall bear on supports.

#### **2304.8.2.4 Cantilevered pieces intermixed pattern.**

The decking shall extend across a minimum of three spans. Pieces in each starter course and every third course shall be simple span pattern. Pieces in other courses shall be cantilevered over the supports with end joints at alternating quarter or third points of the spans. Each piece shall bear on at least one support.

**2304.8.2.5 Controlled random pattern.** The decking shall extend across a minimum of three spans. End joints of pieces within 6 inches (152 mm) of the end joints of the adjacent pieces in either direction shall be separated by at least two intervening courses. In the end bays, each piece shall bear on at least one support. Where an end joint occurs in an end bay, the next piece in the same course shall continue over the

first inner support for at least 24 inches (610 mm). The details of the controlled random pattern shall be as specified for each decking material in Section 2304.8.3.3, 2304.8.4.3 or 2304.8.5.3. Decking that cantilevers beyond a support for a horizontal distance greater than 18 inches (457 mm), 24 inches (610 mm) or 36 inches (914 mm) for 2-inch (51 mm), 3-inch (76 mm) and 4-inch (102 mm) nominal thickness decking, respectively, shall comply with the following:

1. The maximum cantilevered length shall be 30 percent of the length of the first adjacent interior span;
2. A structural fascia shall be fastened to each decking piece to maintain a continuous, straight line; and
3. There shall be no endjoints in the decking between the cantilevered end of the decking and the centerline of the first adjacent interior span.

#### **2304.8.3 Mechanically laminated decking.**

**2304.8.3.1 General.** Mechanically laminated decking consists of square-edged dimension lumber laminations set on edge and nailed to the adjacent pieces and to the supports.

**2304.8.3.2 Nailing.** The length of nails connecting laminations shall not be less than two and one-half times the net thickness of each lamination. Where decking supports are 48 inches (1219 mm) on center (o.c.) or less, side nails shall be installed not more than 30 inches (762 mm) o.c. alternating between top and bottom edges, and staggered one-third of the spacing in adjacent laminations. Where supports are spaced more than 48 inches (1219 mm) o.c., side nails shall be installed not more than 18 inches (457 mm) o.c. alternating between top and bottom edges and staggered one-third of the spacing in adjacent laminations. Two side nails shall be installed at each end of butt-jointed pieces. Laminations shall be toenailed to supports with 20d or larger common nails. Where the supports are 48 inches (1219 mm) o.c. or less, alternate laminations shall be toenailed to alternate supports; where supports are spaced more than 48 inches (1219 mm) o.c., alternate laminations shall be toenailed to every support.

**2304.8.3.3 Controlled random pattern.** There shall be a minimum distance of 24 inches (610 mm) between end joints in adjacent courses. The pieces in the first and second courses shall bear on at least two supports with end joints in these two courses occurring on alternate supports. A maximum of seven intervening

courses shall be permitted before this pattern is repeated.

#### **2304.8.4 Two-inch sawn tongue-and-groove decking.**

**2304.8.4.1 General.** Two-inch (51 mm) decking shall have a maximum moisture content of 15 percent. Decking shall be machined with a single tongue-and-groove pattern. Each decking piece shall be nailed to each support.

**2304.8.4.2 Nailing.** Each piece of decking shall be toenailed at each support with one 16d common nail through the tongue and face-nailed with one 16d common nail.

**2304.8.4.3 Controlled random pattern.** There shall be a minimum distance of 24 inches (610 mm) between end joints in adjacent courses. The pieces in the first and second courses shall bear on at least two supports with end joints in these two courses occurring on alternate supports. A maximum of seven intervening courses shall be permitted before this pattern is repeated.

#### **2304.8.5 Three- and 4-inch sawn tongue-and-groove decking.**

**2304.8.5.1 General.** Three-inch (76 mm) and 4-inch (102 mm) decking shall have a maximum moisture content of 19 percent. Decking shall be machined with a double tongue-and-groove pattern. Decking pieces shall be interconnected and nailed to the supports.

**2304.8.5.2 Nailing.** Each piece shall be toenailed at each support with one 40d common nail and face-nailed with one 60d common nail. Courses shall be spiked to each other with 8-inch (203 mm) spikes at maximum intervals of 30 inches (762 mm) through predrilled edge holes penetrating to a depth of approximately 4 inches (102 mm). One spike shall be installed at a distance not exceeding 10 inches (254 mm) from the end of each piece.

**2304.8.5.3 Controlled random pattern.** There shall be a minimum distance of 48 inches (1219 mm) between end joints in adjacent courses. Pieces not bearing on a support are permitted to be located in interior bays provided the adjacent pieces in the same course continue over the support for at least 24 inches (610 mm). This condition shall not occur more than once in every six courses in each interior bay.

#### **2304.9 Connections and fasteners.**

**2304.9.1 Fastener requirements.** Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The number and size of fasteners connecting wood members shall not be less than that set forth in Table 2304.9.1.

**TABLE 2304.9.1  
FASTENING SCHEDULE**

CONNECTION	FASTENING <sup>a,m</sup>	LOCATION
1. Joist to sill or girder	3 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
2. Bridging to joist	2 - 8d common (2½" × 0.131") 2 - 3" × 0.131" nails 2 - 3" 14 gage staples	toenail each end
3. 1" × 6" subfloor or less to each joist	2 - 8d common (2½" × 0.131")	face nail
4. Wider than 1" × 6" subfloor to each joist	3 - 8d common (2½" × 0.131")	face nail
5. 2" subfloor to joist or girder	2 - 16d common (3½" × 0.162")	blind and face nail
6. Sole plate to joist or blocking	16d (3½" × 0.135") at 16" o.c. 3" × 0.131" nails at 8" o.c. 3" 14 gage staples at 12" o.c.	typical face nail
Sole plate to joist or blocking at braced wall panel	3 - 16d (3½" × 0.135") at 16" o.c. 4 - 3" × 0.131" nails at 16" o.c. 4 - 3" 14 gage staples at 16" o.c.	braced wall panels
7. Top plate to stud	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	end nail
8. Stud to sole plate	4 - 8d common (2½" × 0.131") 4 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	end nail
9. Double studs	16d (3½" × 0.135") at 24" o.c. 3" × 0.131" nail at 8" o.c. 3" 14 gage staple at 8" o.c.	face nail
10. Double top plates	16d (3½" × 0.135") at 16" o.c. 3" × 0.131" nail at 12" o.c. 3" 14 gage staple at 12" o.c.	typical face nail
Double top plates	8 - 16d common (3½" × 0.162") 12 - 3" × 0.131" nails 12 - 3" 14 gage staples	lap splice
11. Blocking between joists or rafters to top plate	3 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
12. Rim joist to top plate	8d (2½" × 0.131") at 6" o.c. 3" × 0.131" nail at 6" o.c. 3" 14 gage staple at 6" o.c.	toenail
13. Top plates, laps and intersections	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
14. Continuous header, two pieces	16d common (3½" × 0.162")	16" o.c. along edge
15. Ceiling joists to plate	3 - 8d common (2½" × 0.131") 5 - 3" × 0.131" nails 5 - 3" 14 gage staples	toenail
16. Continuous header to stud	4 - 8d common (2½" × 0.131")	toenail
17. Ceiling joists, laps over partitions (see Section 2308.10.4.1, Table 2308.10.4.1)	3 - 16d common (3½" × 0.162") minimum, Table 2308.10.4.1 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail

(continued)



**TABLE 2304.9.1—continued  
FASTENING SCHEDULE**

CONNECTION	FASTENING <sup>a, m</sup>	LOCATION
18. Ceiling joists to parallel rafters (see Section 2308.10.4.1, Table 2308.10.4.1)	3 - 16d common (3½" × 0.162") minimum, Table 2308.10.4.1 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
19. Rafter to plate (see Section 2308.10.1, Table 2308.10.1)	3 - 8d common (2½" × 0.131") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
20. 1" diagonal brace to each stud and plate	2 - 8d common (2½" × 0.131") 2 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
21. 1" × 8" sheathing to each bearing	3 - 8d common (2½" × 0.131")	face nail
22. Wider than 1" × 8" sheathing to each bearing	3 - 8d common (2½" × 0.131")	face nail
23. Built-up corner studs	16d common (3½" × 0.162") 3" × 0.131" nails 3" 14 gage staples	24" o.c. 16" o.c. 16" o.c.
24. Built-up girder and beams	20d common (4" × 0.192") 32" o.c. 3" × 0.131" nail at 24" o.c. 3" 14 gage staple at 24" o.c.	face nail at top and bottom stag- gered on opposite sides
	2 - 20d common (4" × 0.192") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail at ends and at each splice
25. 2" planks	16d common (3½" × 0.162")	at each bearing
26. Collar tie to rafter	3 - 10d common (3" × 0.148") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
27. Jack rafter to hip	3 - 10d common (3" × 0.148") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	toenail
	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
28. Roof rafter to 2-by ridge beam	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	toenail
	2 - 16d common (3½" × 0.162") 3 - 3" × 0.131" nails 3 - 3" 14 gage staples	face nail
29. Joist to band joist	3 - 16d common (3½" × 0.162") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	face nail
30. Ledger strip	3 - 16d common (3½" × 0.162") 4 - 3" × 0.131" nails 4 - 3" 14 gage staples	
31. Wood structural panels and particleboard <sup>b</sup> Subfloor, roof and wall sheathing (to framing)	½" and less  19/32" to ¾"  7/8" to 1" 1 1/8" to 1 1/4"  Single floor (combination subfloor-underlayment to framing)  ¾" and less 7/8" to 1" 1 1/8" to 1 1/4"	6d <sup>c, 1</sup> 2 3/8" × 0.113" nail <sup>n</sup> 1 3/4" 16 gage <sup>o</sup> 8d <sup>d</sup> or 6d <sup>e</sup> 2 3/8" × 0.113" nail <sup>p</sup> 2" 16 gage <sup>p</sup> 8d <sup>c</sup> 10d <sup>d</sup> or 8d <sup>e</sup>  6d <sup>c</sup> 8d <sup>e</sup> 10d <sup>d</sup> or 8d <sup>e</sup>

(continued)

TABLE 2304.9.1—continued  
FASTENING SCHEDULE

CONNECTION	FASTENING <sup>a,m</sup>		LOCATION
32. Panel siding (to framing)	$\frac{1}{2}$ " or less $\frac{5}{8}$ "	6d <sup>f</sup> 8d <sup>f</sup>	
33. Fiberboard sheathing <sup>g</sup>	$\frac{1}{2}$ " $\frac{25}{32}$ "	No. 11 gage roofing nail <sup>h</sup> 6d common nail (2" × 0.113") No. 16 gage staple <sup>i</sup> No. 11 gage roofing nail <sup>h</sup> 8d common nail ( $2\frac{1}{2}$ " × 0.131") No. 16 gage staple <sup>i</sup>	
34. Interior paneling	$\frac{1}{4}$ " $\frac{3}{8}$ "	4d <sup>j</sup> 6d <sup>k</sup>	

For SI: 1 inch = 25.4 mm.

- Common or box nails are permitted to be used except where otherwise stated.
- Nails spaced at 6 inches on center at edges, 12 inches at intermediate supports except 6 inches at supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.
- Common or deformed shank (6d - 2" × 0.113"; 8d -  $2\frac{1}{2}$ " × 0.131"; 10d - 3" × 0.148").
- Common (6d - 2" × 0.113"; 8d -  $2\frac{1}{2}$ " × 0.131"; 10d - 3" × 0.148").
- Deformed shank (6d - 2" × 0.113"; 8d -  $2\frac{1}{2}$ " × 0.131"; 10d - 3" × 0.148").
- Corrosion-resistant siding (6d -  $1\frac{7}{8}$ " × 0.106"; 8d -  $2\frac{3}{8}$ " × 0.128") or casing (6d - 2" × 0.099"; 8d -  $2\frac{1}{2}$ " × 0.113") nail.
- Fasteners spaced 3 inches on center at exterior edges and 6 inches on center at intermediate supports, when used as structural sheathing. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications.
- Corrosion-resistant roofing nails with  $\frac{7}{16}$ -inch-diameter head and  $1\frac{1}{2}$ -inch length for  $\frac{1}{2}$ -inch sheathing and  $1\frac{3}{4}$ -inch length for  $\frac{25}{32}$ -inch sheathing.
- Corrosion-resistant staples with nominal  $\frac{7}{16}$ -inch crown or 1-inch crown and  $1\frac{1}{4}$ -inch length for  $\frac{1}{2}$ -inch sheathing and  $1\frac{1}{2}$ -inch length for  $\frac{25}{32}$ -inch sheathing. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).
- Casing ( $1\frac{1}{2}$ " × 0.080") or finish ( $1\frac{1}{2}$ " × 0.072") nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- Panel supports at 24 inches. Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- For roof sheathing applications, 8d nails ( $2\frac{1}{2}$ " × 0.113") are the minimum required for wood structural panels.
- Staples shall have a minimum crown width of  $\frac{7}{16}$  inch.
- For roof sheathing applications, fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.
- Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports for subfloor and wall sheathing and 3 inches on center at edges, 6 inches at intermediate supports for roof sheathing.
- Fasteners spaced 4 inches on center at edges, 8 inches at intermediate supports.

**2304.9.2 Sheathing fasteners.** Sheathing nails or other approved sheathing connectors shall be driven so that their head or crown is flush with the surface of the sheathing.

**2304.9.3 Joist hangers and framing anchors.** Connections depending on joist hangers or framing anchors, ties and other mechanical fastenings not otherwise covered are permitted where approved. The vertical load-bearing capacity, torsional moment capacity and deflection characteristics of joist hangers shall be determined in accordance with Section 1716.1.

**2304.9.4 Other fasteners.** Clips, staples, glues and other approved methods of fastening are permitted where approved.

**2304.9.5 Fasteners and connectors in contact with preservative-treated and fire-retardant-treated wood.** Fasteners and connectors in contact with preservative-treated and fire-retardant-treated wood shall be in accordance with Sections 2304.9.5.1 through 2304.9.5.4. The coating weights for zinc-coated fasteners shall be in accordance with ASTM A 153.

**2304.9.5.1 Fasteners and connectors for preservative-treated wood.** Fasteners in contact with preservative-treated wood shall be of hot-dipped zinc-coated

galvanized steel, stainless steel, silicon bronze or copper. Fasteners other than nails, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum. Connectors that are used in exterior applications and in contact with preservative-treated wood shall have coating types and weights in accordance with the treated wood or connector manufacturer's recommendations. In the absence of manufacturer's recommendations, a minimum of ASTM A 653, type G185 zinc-coated galvanized steel, or equivalent, shall be used.

**Exception:** Plain carbon steel fasteners in SBX/DOT and zinc borate preservative-treated wood in an interior, dry environment shall be permitted.

**2304.9.5.2 Fastenings for wood foundations.** Fastenings for wood foundations shall be as required in AF&PA PWF.

**2304.9.5.3 Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations.** Fasteners for fire-retardant-treated wood used in exterior applications or wet or damp locations shall be of hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Fasteners other than

nails, timber rivets, wood screws and lag screws shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.

**2304.9.5.4 Fasteners for fire-retardant-treated wood used in interior applications.** Fasteners for fire-retardant-treated wood used in interior locations shall be in accordance with the manufacturer's recommendations. In the absence of manufacturer's recommendations, Section 2304.9.5.3 shall apply.

**2304.9.6 Load path.** Where wall framing members are not continuous from foundation sill to roof, the members shall be secured to ensure a continuous load path. Where required, sheet metal clamps, ties or clips shall be formed of galvanized steel or other approved corrosion-resistant material not less than 0.040 inch (1.01 mm) nominal thickness.

**2304.9.7 Framing requirements.** Wood columns and posts shall be framed to provide full end bearing. Alternatively, column-and-post end connections shall be designed to resist the full compressive loads, neglecting end-bearing capacity. Column-and-post end connections shall be fastened to resist lateral and net induced uplift forces.

## **2304.10 Heavy timber construction.**

### **2304.10.1 Minimum member sizes.**

**2304.10.1.1 Columns.** Columns shall be at least 8 inches (203 mm) in all dimensions when supporting floor loads and at least 6 inches (152 mm) wide and 8 inches (203 mm) deep when supporting roof and ceiling loads only.

**2304.10.1.2 Beams and girders.** Beams and girders shall be at least 6 inches (152 mm) wide and 10 inches (254 mm) deep.

**2304.10.1.3 Frames and arches.** Frames and arches that spring from grade or the floor line and support floor loads shall be at least 8 inches (203 mm) in all dimensions. Frames or arches for roof construction that spring from grade or the floor line and do not support floor loads shall have members at least 6 inches (152 mm) wide and 8 inches (203 mm) deep for the lower half of the height, and at least 6 inches (152 mm) deep for the upper half. Frames or arches for roof construction that spring from the top of walls or wall abutments, framed timber trusses, and other roof framing, which do not support floor loads, shall have members at least 4 inches (102 mm) wide and 6 inches (152 mm) deep. Spaced members may be composed of two or more pieces at least 3 inches (76 mm) thick when blocked solidly through their intervening spaces or when such spaces are tightly closed by a continuous wood cover plate at least 2 inches (51 mm) thick secured to the underside of the members. Splice plates shall be at least 3 inches (76 mm) thick. When protected by approved automatic sprinklers under the roof deck, framing members shall be at least 3 inches (76 mm) wide.

**2304.10.1.4 Trusses.** Timber trusses supporting floor loads shall have members at least 8 inches (203 mm) in all dimensions.

**2304.10.2 Columns.** Columns shall be continuous or superimposed throughout all stories by means of reinforced concrete or metal caps with brackets, or shall be connected by properly designed steel or iron caps, with pintles and base plates, or by timber splice plates affixed to the columns by metal connectors housed within the contact faces, or by other approved methods.

**2304.10.2.1 Column connections.** Girders and beams shall be closely fitted around columns and adjoining ends shall be cross tied to each other, or inter tied by caps or ties, to transfer horizontal loads across joints. Wood bolsters shall not be placed on tops of columns unless the columns support roof loads only.

**2304.10.3 Floor framing.** Approved wall plate boxes or hangers shall be provided where wood beams, girders or trusses rest on masonry or concrete walls. Where intermediate beams are used to support a floor, they shall rest on top of girders, or shall be supported by ledgers or blocks securely fastened to the sides of the girders, or they shall be supported by an approved metal hanger into which the ends of the beams shall be closely fitted.

**2304.10.4 Roof framing.** Every roof girder and at least every alternate roof beam shall be anchored to its supporting member; and every monitor and every sawtooth construction shall be anchored to the main roof construction. Such anchors shall consist of steel bolts of sufficient strength to resist vertical uplift of the roof.

**2304.10.5 Floor decks.** Floor decks and covering shall not extend closer than  $\frac{1}{2}$  inch (12.7 mm) to walls. Such  $\frac{1}{2}$ -inch (12.7 mm) spaces shall be covered by a molding fastened to the wall either above or below the floor and arranged such that the molding will not obstruct the expansion or contraction movements of the floor. Corbeling of masonry walls under floors is permitted in place of such molding.

**2304.10.6 Roof decks.** Where supported by a wall, roof decks shall be anchored to walls to resist uplift forces determined in accordance with Chapter 16. Such anchors shall consist of steel bolts of sufficient strength to resist vertical uplift of the roof.

**2304.10.7 Fabrication.** All timber shall be accurately cut and framed to a close fit in such a manner that the joints will have even bearing over the contact surfaces. Mortises shall be true to size for their full depth and tenons shall fit snugly. No shimming in joints, or open joints, shall be permitted.

**2304.10.8 Erection.** Joints shall have a tight fit. Fasteners shall be installed in a manner that will not damage the wood. End compression joints shall be brought to full bearing. All framework shall be carried up true and plumb. As erection progresses, the work shall be bolted, or nailed as necessary, to resist all dead load, wind, and erection stresses. The structure shall be properly aligned before final tightening of the connections.

### 2304.11 Protection against decay and termites.

**2304.11.1 General.** Where required by this section, protection from decay and termites shall be provided by the use of naturally durable or preservative-treated wood.

**2304.11.2 Wood used above ground.** Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWP A U1 (Commodity Specifications A or F) for above-ground use.

**2304.11.2.1 Joists, girders and subfloor.** Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches (457 mm), or wood girders are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor construction (including posts, girders, joists and subfloor) shall be of naturally durable or preservative-treated wood.

**2304.11.2.2 Wood supported by exterior foundation walls.** Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or preservative-treated wood.

**2304.11.2.3 Exterior walls below grade.** Wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade shall be of approved naturally durable or preservative-treated wood.

**2304.11.2.4 Sleepers and sills.** Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or preservative-treated wood.

**2304.11.2.5 Girder ends.** The ends of wood girders entering exterior masonry or concrete walls shall be provided with a 1/2-inch (12.7 mm) air space on top, sides and end, unless naturally durable or preservative-treated wood is used.

**2304.11.2.6 Wood siding.** Clearance between wood siding and earth on the exterior of a building shall not be less than 8 inches (203 mm) or less than 2 inches (51 mm) vertical from covered concrete steps, porch slabs, patio slabs and similar horizontal surfaces exposed to the weather.

**2304.11.2.7 Posts or columns.** Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth shall be of naturally durable or preservative-treated wood.

#### Exceptions:

1. Posts or columns that are either exposed to the weather or located in basements or cellars, supported by concrete piers or metal pedestals projected at least 1 inch (25 mm) above the slab or

deck and 6 inches (152 mm) above exposed earth, and are separated therefrom by an impervious moisture barrier.

2. Posts or columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building, supported by a concrete pier or metal pedestal at a height greater than 8 inches (203 mm) from exposed ground, and are separated there from by an impervious moisture barrier.

**2304.11.3 Laminated timbers.** The portions of glued-laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not fully protected from moisture by a roof, eave or similar covering shall be pressure treated with preservative or be manufactured from naturally durable or preservative-treated wood.

**2304.11.4 Wood in contact with the ground or fresh water.** Wood used in contact with the ground (exposed earth) in the locations specified in Sections 2304.11.4.1 and 2304.11.4.2 shall be naturally durable (species for both decay and termite resistance) or preservative-treated using water-borne preservatives in accordance with AWP A U1 (Commodity Specifications A or F) for soil or fresh water use.

**Exception:** Untreated wood is permitted where such wood is continuously and entirely below the groundwater level or submerged in fresh water.

**2304.11.4.1 Posts or columns.** Posts and columns supporting permanent structures that are embedded in concrete that is in direct contact with the earth, embedded in concrete that is exposed to the weather or in direct contact with the earth shall be of preservative-treated wood.

**2304.11.4.2 Wood structural members.** Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier.

**2304.11.5 Supporting member for permanent appurtenances.** Naturally durable or preservative-treated wood shall be utilized for those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhang or other covering to prevent moisture or water accumulation on the surface or at joints between members.

**2304.11.6 Termite protection.** In geographical areas where hazard of termite damage is known to be very heavy, wood floor framing shall be of naturally durable species (termite resistant) or preservative treated in accordance with AWP A U1 for the species, product preservative and end use or provided with approved methods of termite protection.



**2304.11.7 Wood used in retaining walls and cribs.** Wood installed in retaining or crib walls shall be preservative treated in accordance with AWP A U1 (Commodity Specifications A or F) for soil and fresh water use.

**2304.11.8 Attic ventilation.** For attic ventilation, see Section 1203.2.

**2304.11.9 Under-floor ventilation (crawl space).** For under-floor ventilation (crawl space), see Section 1203.3.

**2304.11.10 Firecutting.** The ends of wood beams, joists and rafters resting on masonry or concrete walls shall be firecut to a bevel of 3 inches (76 mm) in depth.

**2304.11.11 Debris.** All loose wood and debris and all wood forms shall be removed from spaces under the building. All stump and roots shall be grubbed to a minimum depth of 12 inches (305 mm).

**2304.12 Long-term loading.** Wood members supporting concrete, masonry or similar materials shall be checked for the effects of long-term loading using the provisions of the AF&PA NDS. The total deflection, including the effects of long-term loading, shall be limited in accordance with Section 1604.3.1 for these supported materials.

**Exception:** Horizontal wood members supporting masonry or concrete nonstructural floor or roof surfacing not more than 4 inches (102 mm) thick need not be checked for long-term loading.

## SECTION BC 2305 GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS

**2305.1 General.** Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the provisions of Sections 2305, 2306 and 2307.

**2305.1.1 Openings in shear panels.** Openings in shear panels that materially affect their strength shall be detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

**2305.2 Diaphragm deflection.** The deflection ( $\Delta$ ) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated by using the following equation. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term shall be modified accordingly.

$$\Delta = \frac{5vL^3}{8EAb} + \frac{vL}{4Gt} + 0.188Le_n + \frac{\Sigma(\Delta_c X)}{2b} \quad (\text{Equation 23-1})$$

$$\text{For SI: } \Delta = \frac{0.052vL^3}{EAb} + \frac{vL}{4Gt} + \frac{Le_n}{1627} + \frac{\Sigma(\Delta_c X)}{2b}$$

where:

$A$  = Area of chord cross section, in square inches ( $\text{mm}^2$ ).

$B$  = Diaphragm width, in feet (mm).

$E$  = Elastic modulus of chords, in pounds per square inch ( $\text{N/mm}^2$ ).

$e_n$  = Staple deformation, in inches (mm). See Table 2305.2(1).

$Gt$  = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth. See Table 2305.2(2).

$L$  = Diaphragm length, in feet (mm).

$v$  = Maximum shear due to design loads in the direction under consideration, in pounds per linear foot (plf) (N/mm).

$\Delta$  = The calculated deflection, in inches (mm).

$\Sigma(\Delta_c X)$  = Sum of individual chord-splice slip values on both sides of the diaphragm, each multiplied by its distance to the nearest support.

**2305.3 Shear wall deflection.** The deflection ( $\Delta$ ) of a blocked wood structural panel shear wall uniformly fastened throughout with staples is permitted to be calculated by the use of the following equation:

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_n + d_a \frac{h}{b} \quad (\text{Equation 23-2})$$

$$\text{For SI: } \Delta = \frac{vh^3}{3EAb} + \frac{vh}{Gt} + \frac{he_n}{407.6} + d_a \frac{h}{b}$$

where:

$A$  = Area of boundary element cross section in square inches ( $\text{mm}^2$ ) (vertical member at shear wall boundary).

$b$  = Wall width, in feet (mm).

$d_a$  = Vertical elongation of overturning anchorage (including fastener slip, device elongation, anchor rod elongation, etc.) at the design shear load ( $v$ ).

$E$  = Elastic modulus of boundary element (vertical member at shear wall boundary), in pounds per square inch (N/mm<sup>2</sup>).

$e_n$  = Staple deformation, in inches (mm) [see Table 2305.2(1)].

$Gt$  = Panel rigidity through the thickness, in pounds per inch (N/mm) of panel width or depth [see Table 2305.2(2)].

$h$  = Wall height, in feet (mm).

$v$  = Maximum shear due to design loads at the top of the wall, in pounds per linear foot (N/mm).

$\Delta$  = The calculated deflection, in inches (mm).

**TABLE 2305.2(1)  
e<sub>n</sub> VALUES (inches) FOR USE IN CALCULATING DIAPHRAGM  
AND SHEAR WALL DEFLECTION DUE TO FASTENER SLIP  
(Structural I)<sup>a, c</sup>**

LOAD PER FASTENER <sup>b</sup> (pounds)	FASTENER DESIGNATIONS
	14-Ga staple x 2 inches long
60	0.011
80	0.018
100	0.028
120	0.04
140	0.053
160	0.068

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

a. Increase  $e_n$  values 20 percent for plywood grades other than Structural I.

b. Load per fastener = maximum shear per foot divided by the number of fasteners per foot at interior panel edges.

c. Decrease  $e_n$  values 50 percent for seasoned lumber (moisture content < 19 percent).

**TABLE 2305.2(2)**  
**VALUES OF  $G_t$  FOR USE IN CALCULATING DEFLECTION OF WOOD STRUCTURAL PANEL SHEAR WALLS AND DIAPHRAGMS**

PANEL TYPE	SPAN RATING	VALUES OF $G_t$ (lb/in. panel depth or width)							
		OTHER				STRUCTURAL I			
		3-ply Plywood	4-ply Plywood	5-ply Plywood <sup>a</sup>	OSB	3-ply Plywood	4-ply Plywood	5-ply Plywood <sup>a</sup>	OSB
Sheathing	24/0	25,000	32,500	37,500	77,500	32,500	42,500	41,500	77,500
	24/16	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	32/16	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	40/20	28,500	37,000	43,000	88,500	37,000	48,000	47,500	88,500
	48/24	31,000	40,500	46,500	96,000	40,500	52,500	51,000	96,000
Single Floor	16 o.c.	27,000	35,000	40,500	83,500	35,000	45,500	44,500	83,500
	20 o.c.	28,000	36,500	42,000	87,000	36,500	47,500	46,000	87,000
	24 o.c.	30,000	39,000	45,000	93,000	39,000	50,500	49,500	93,000
	32 o.c.	36,000	47,000	54,000	110,000	47,000	61,000	59,500	110,000
	48 o.c.	50,500	65,500	76,000	155,000	65,500	85,000	83,500	155,000

	Thickness (in.)	OTHER			STRUCTURAL I		
		A-A, A-C	Marine	All Other Grades	A-A, A-C	Marine	All Other Grades
Sanded Plywood	$\frac{1}{4}$	24,000	31,000	24,000	31,000	31,000	31,000
	$\frac{11}{32}$	25,500	33,000	25,500	33,000	33,000	33,000
	$\frac{3}{8}$	26,000	34,000	26,000	34,000	34,000	34,000
	$\frac{15}{32}$	38,000	49,500	38,000	49,500	49,500	49,500
	$\frac{1}{2}$	38,500	50,000	38,500	50,000	50,000	50,000
	$\frac{19}{32}$	49,000	63,500	49,000	63,500	63,500	63,500
	$\frac{5}{8}$	49,500	64,500	49,500	64,500	64,500	64,500
	$\frac{23}{32}$	50,500	65,500	50,500	65,500	65,500	65,500
	$\frac{3}{4}$	51,000	66,500	51,000	66,500	66,500	66,500
	$\frac{7}{8}$	52,500	68,500	52,500	68,500	68,500	68,500
	1	73,500	95,500	73,500	95,500	95,500	95,500
	$1\frac{1}{8}$	75,000	97,500	75,000	97,500	97,500	97,500

For SI: 1 inch = 25.4 mm, 1 pound/inch = 0.1751 N/mm.

a. Applies to plywood with five or more layers; for five-ply/three-layer plywood, use values for four ply.

### SECTION BC 2306 ALLOWABLE STRESS DESIGN

**2306.1 Allowable stress design.** The structural analysis and construction of wood elements in structures using allowable stress design shall be in accordance with the following applicable standards:

#### American Forest & Paper Association.

NDS National Design Specification for Wood Construction

SDPWS Special Design Provisions for Wind and Seismic

#### American Institute of Timber Construction.

AITC 104 Typical Construction Details

AITC 110 Standard Appearance Grades for Structural Glued Laminated Timber

AITC 113

Standard for Dimensions of Structural Glued Laminated Timber

AITC 117

Standard Specifications for Structural Glued Laminated Timber of Softwood Species

AITC 119

Standard Specifications for Structural Glued Laminated Timber of Hardwood Species

ANSI/AITC A190.1 Structural Glued Laminated Timber

AITC 200 Inspection Manual

**American Society of Agricultural and Biological Engineers.**

ASABE EP 484.2 Diaphragm Design of Metal-clad, Post-Frame Rectangular Buildings

- ASABE EP 486.1 Shallow Post Foundation Design  
 ASABE 559 Design Requirements and Bending Properties for Mechanically Laminated Columns

### APA—The Engineered Wood Association.

Panel Design Specification

Plywood Design Specification Supplement 1 - Design & Fabrication of Plywood Curved Panel

Plywood Design Specification Supplement 2 - Design & Fabrication of Glued Plywood-lumber Beams

Plywood Design Specification Supplement 3 -Design & Fabrication of Plywood Stressed-skin Panels

Plywood Design Specification Supplement 4 - Design & Fabrication of Plywood Sandwich Panels

Plywood Design Specification Supplement 5 - Design & Fabrication of All-plywood Beams

EWS T300 Glulam Connection Details

EWS S560 Field Notching and Drilling of Glued Laminated Timber Beams

EWS S475 Glued Laminated Beam Design Tables

EWS X450 Glulam in Residential Construction

EWS X440 Product and Application Guide: Glulam

EWS R540 Builders Tips: Proper Storage and Handling of Glulam Beams

### Truss Plate Institute, Inc.

TPI 1 National Design Standard for Metal Plate Connected Wood Truss Construction

**2306.1.1 Joists and rafters.** The design of rafter spans is permitted to be in accordance with the AF&PA Span Tables for Joists and Rafters.

**2306.1.2 Plank and beam flooring.** The design of plank and beam flooring is permitted to be in accordance with the AF&PA Wood Construction Data No. 4.

**2306.1.3 Treated wood stress adjustments.** The allowable unit stresses for preservative-treated wood need no adjustment for treatment, but are subject to other adjustments. The allowable unit stresses for fire-retardant-treated wood, including fastener values, shall be developed from an approved method of investigation that considers the effects of anticipated temperature and humidity to which the fire-retardant-treated wood will be subjected, the type of treatment and the redrying process. Other adjustments are applicable except that the impact load duration shall not apply.

**2306.1.4 Lumber decking.** The capacity of lumber decking arranged according to the patterns described in Section 2304.8.2 shall be the lesser of the capacities determined

for flexure and deflection according to the formulas in Table 2306.1.4.

**TABLE 2306.1.4  
ALLOWABLE LOADS FOR LUMBER DECKING**

PATTERN	ALLOWABLE AREA LOAD <sup>a, b</sup>	
	Flexure	Deflection
Simple span	$\sigma_b = \frac{8F'_b d^2}{l^2 6}$	$\sigma_\Delta = \frac{384\Delta E' d^3}{5l^4 12}$
Two-span continuous	$\sigma_b = \frac{8F'_b d^2}{l^2 6}$	$\sigma_\Delta = \frac{185\Delta E' d^3}{l^4 12}$
Combination simple- and two-span continuous	$\sigma_b = \frac{8F'_b d^2}{l^2 6}$	$\sigma_\Delta = \frac{131\Delta E' d^3}{l^4 12}$
Cantilevered pieces intermixed	$\sigma_b = \frac{20F'_b d^2}{3l^2 6}$	$\sigma_\Delta = \frac{105\Delta E' d^3}{l^4 12}$
<b>Controlled random layout</b>		
Mechanically laminated decking	$\sigma_b = \frac{20F'_b d^2}{3l^2 6}$	$\sigma_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
2-inch decking	$\sigma_b = \frac{20F'_b d^2}{3l^2 6}$	$\sigma_\Delta = \frac{100\Delta E' d^3}{l^4 12}$
3-inch and 4-inch decking	$\sigma_b = \frac{20F'_b d^2}{3l^2 6}$	$\sigma_\Delta = \frac{116\Delta E' d^3}{l^4 12}$

For SI: 1 inch = 25.4 mm.

a.  $\sigma_b$  = Allowable total uniform load limited by bending.

$\sigma_\Delta$  = Allowable total uniform load limited by deflection.

b.  $d$  = Actual decking thickness.

$l$  = Span of decking.

$F'_b$  = Allowable bending stress adjusted by applicable factors.

$E'$  = Modulus of elasticity adjusted by applicable factors.

### 2306.2 Wood diaphragms.

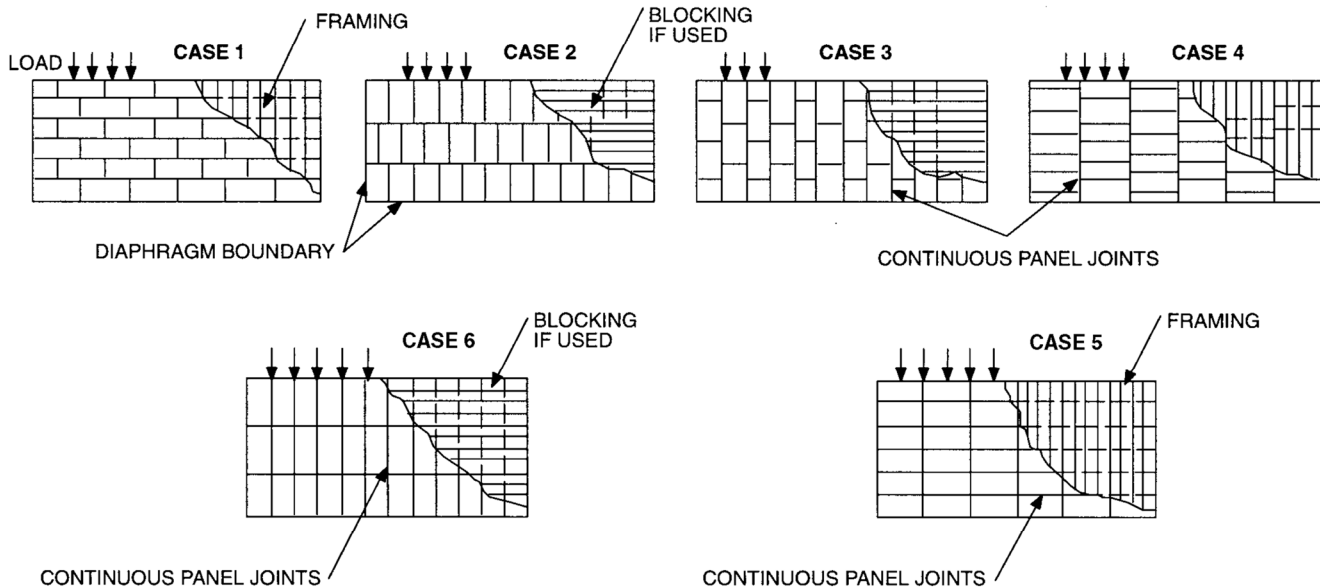
**2306.2.1 Wood structural panel diaphragms.** Wood structural panel diaphragms shall be designed and constructed in accordance with AF&PA SDPWS. Wood structural panel diaphragms are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.2.1(1) or 2306.2.1(2). The allowable shear capacities in Tables 2306.2.1(1) and 2306.2.1(2) are permitted to be increased 40 percent for wind design.

TABLE 2306.2.1(1)  
ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL DIAPHRAGMS WITH  
FRAMING OF DOUGLAS FIR-LARCH, OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b</sup>

PANEL GRADE	COMMON NAIL SIZE OR STAPLE <sup>f</sup> LENGTH AND GAGE	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBERS AT ADJOINING PANEL EDGES AND BOUNDARIES <sup>g</sup> (inches)	BLOCKED DIAPHRAGMS						UNBLOCKED DIAPHRAGMS	
					Fastener spacing (inches) at diaphragm boundaries (all cases) at continuous panel edges parallel to load (Cases 3, 4), and at all panel edges (Cases 5, 6) <sup>b</sup>						Fasteners spaced 6 max. at supported edges <sup>b</sup>	
					6	4	2 1/2 <sup>c</sup>	2 <sup>c</sup>	Fastener spacing (inches) at other panel edges (Cases 1, 2, 3 and 4) <sup>b</sup>		Case 1 (No unblocked edges or continuous joints parallel to load)	
					6	6	4	3	6	4	6	All other configurations (Cases 2, 3, 4, 5 and 6)
Structural I grades	8d (2 1/2" × 0.131")	1 3/8	3/8	2	270	360	530	600	240	600	240	180
	1 1/2 16 Gage	1		3	300	400	600	675	265	675	265	200
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	175	235	350	400	155	400	155	115
	1 1/2 16 Gage	1	15/32	3	200	265	395	450	175	450	175	130
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	320	425	640	730	285	730	285	215
	1 1/2 16 Gage	1		3	360	480	720	820	320	820	320	240
	6d <sup>e</sup> (2" × 0.113")	1 1/4	3/8	2	175	235	350	400	155	400	155	120
	8d (2 1/2" × 0.131")	1 3/8		3	200	265	395	450	175	450	175	130
	1 1/2 16 Gage	1		2	185	250	375	420	165	420	165	125
	8d (2 1/2" × 0.131")	1 3/8	7/16	3	210	280	420	475	185	475	185	140
	1 1/2 16 Gage	1		2	240	320	480	545	215	545	215	160
	8d (2 1/2" × 0.131")	1 3/8		3	270	360	540	610	240	610	240	180
Sheathing, single floor and other grades covered in DOC PS 1 and PS 2	1 1/2 16 Gage	1	15/32	2	160	210	315	360	140	360	140	105
	8d (2 1/2" × 0.131")	1 3/8		3	180	235	355	400	160	400	160	120
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	255	340	505	575	230	575	230	170
	1 1/2 16 Gage	1	19/32	3	285	380	570	645	255	645	255	190
	8d (2 1/2" × 0.131")	1 3/8		2	165	225	335	380	150	380	150	110
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	190	250	375	425	165	425	165	125
	1 1/2 16 Gage	1	15/32	2	270	360	530	600	240	600	240	180
	8d (2 1/2" × 0.131")	1 3/8		3	300	400	600	675	265	675	265	200
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	290	385	575	655	255	655	255	190
	1 1/2 16 Gage	1	19/32	3	325	430	650	735	290	735	290	215
	8d (2 1/2" × 0.131")	1 3/8		2	160	210	315	360	140	360	140	105
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	180	235	355	405	160	405	160	120
Structural I grades	1 1/2 16 Gage	1	19/32	2	320	425	640	730	285	730	285	215
	8d (2 1/2" × 0.131")	1 3/8		3	360	480	720	820	320	820	320	240
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	175	235	350	400	155	400	155	115
Structural I grades	1 1/2 16 Gage	1	19/32	3	200	265	395	450	175	450	175	130
	8d (2 1/2" × 0.131")	1 3/8		2	185	250	375	420	165	420	165	125
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	210	280	420	475	185	475	185	140
Structural I grades	1 1/2 16 Gage	1	15/32	2	240	320	480	545	215	545	215	160
	8d (2 1/2" × 0.131")	1 3/8		3	270	360	540	610	240	610	240	180
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	160	210	315	360	140	360	140	105
Structural I grades	1 1/2 16 Gage	1	15/32	3	180	235	355	400	160	400	160	120
	8d (2 1/2" × 0.131")	1 3/8		2	255	340	505	575	230	575	230	170
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	285	380	570	645	255	645	255	190
Structural I grades	1 1/2 16 Gage	1	15/32	2	165	225	335	380	150	380	150	110
	8d (2 1/2" × 0.131")	1 3/8		3	190	250	375	425	165	425	165	125
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	270	360	530	600	240	600	240	180
Structural I grades	1 1/2 16 Gage	1	15/32	3	300	400	600	675	265	675	265	200
	8d (2 1/2" × 0.131")	1 3/8		2	290	385	575	655	255	655	255	190
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	325	430	650	735	290	735	290	215
Structural I grades	1 1/2 16 Gage	1	19/32	2	160	210	315	360	140	360	140	105
	8d (2 1/2" × 0.131")	1 3/8		3	180	235	355	405	160	405	160	120
	10d <sup>d</sup> (3" × 0.148")	1 1/2		2	320	425	640	730	285	730	285	215
Structural I grades	1 1/2 16 Gage	1	19/32	3	360	480	720	820	320	820	320	240
	8d (2 1/2" × 0.131")	1 3/8		2	175	235	350	400	155	400	155	115
	10d <sup>d</sup> (3" × 0.148")	1 1/2		3	200	265	395	450	175	450	175	130



TABLE 2306.2.1(1)—continued  
 ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL DIAPHRAGMS WITH  
 FRAMING OF DOUGLAS FIR-LARCH, OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b</sup>



For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor =  $[1 - (0.5 - SG)]$ , where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.
- b. Space fasteners maximum 12 inches o.c. along intermediate framing members (6 inches o.c. where supports are spaced 48 inches o.c.).
- c. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails at all panel edges shall be staggered where panel edge nailing is specified at 2½ inches o.c. or less.
- d. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails at all panel edges shall be staggered where both of the following conditions are met: (1) 10d nails having penetration into framing of more than 1½ inches and (2) panel edge nailing is specified at 3 inches o.c. or less.
- e. 8d is recommended minimum for roofs due to negative pressures of high winds.
- f. Staples shall have a minimum crown width of 7/16 inch and shall be installed with their crowns parallel to the long dimension of the framing members.
- g. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.
- h. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

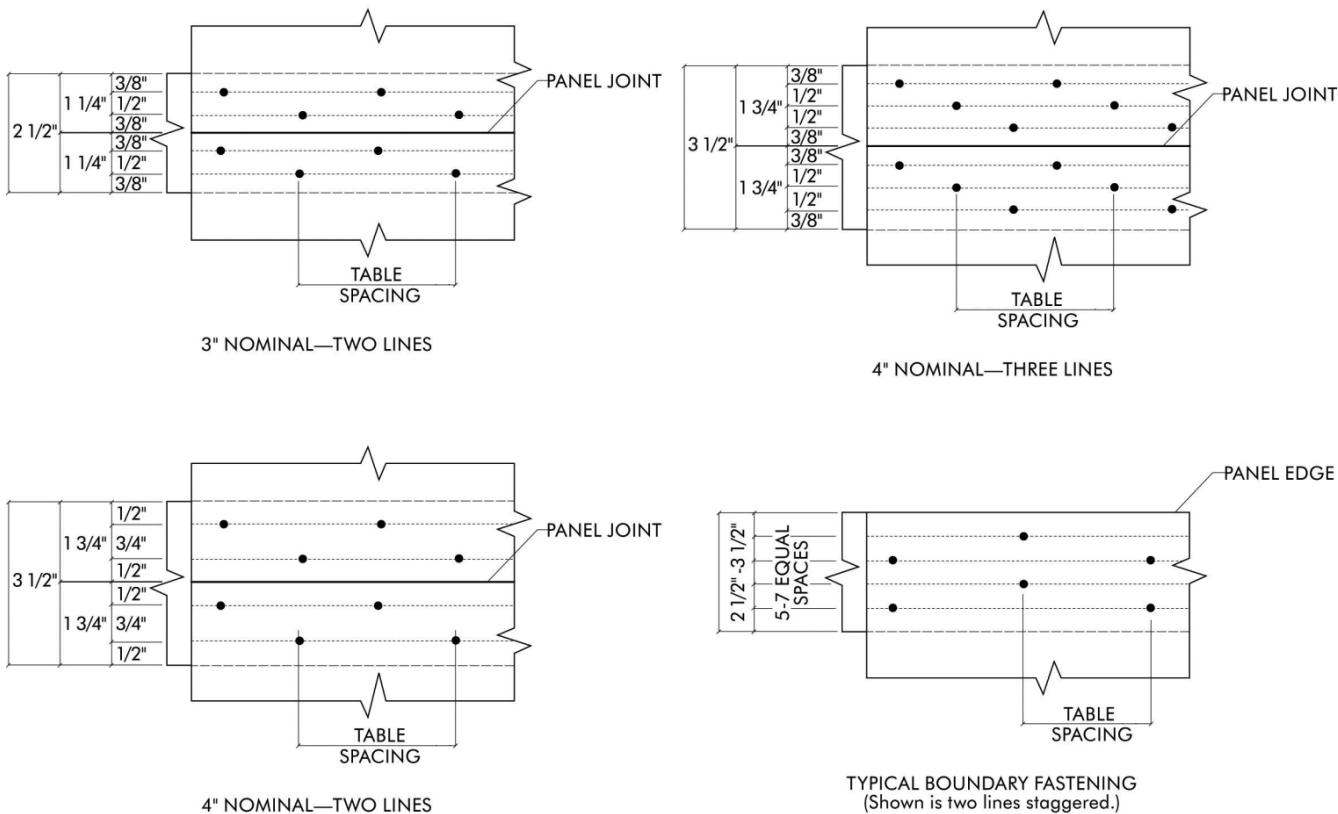
**TABLE 2306.2.1(2)**  
**ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL BLOCKED DIAPHRAGMS**  
**UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH LOAD DIAPHRAGMS) WITH FRAMING OF**  
**DOUGLAS FIR-LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b, g, h</sup>**

PANEL GRADE <sup>c</sup>	COMMON NAIL SIZE OR STAPLE <sup>f</sup> GAGE	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM NOMINAL WIDTH OF FRAMING MEMBER AT ADJOINING PANEL EDGES AND BOUNDARIES <sup>e</sup>	LINES OF FASTENERS	BLOCKED DIAPHRAGMS					
						Cases 1 and 2 <sup>d</sup>					
						Fastener Spacing Per Line at Boundaries (inches)					
						4	2 1/2	2			
						Fastener Spacing Per Line at Other Panel Edges (inches)					
						6	4	4	3	3	2
Structural I grades	10d common nails	1 1/2	15/32	3	2	605	815	875	1,150	—	—
				4	2	700	915	1,005	1,290	—	—
				4	3	875	1,220	1,285	1,395	—	—
			19/32	3	2	670	880	965	1,255	—	—
				4	2	780	990	1,110	1,440	—	—
				4	3	965	1,320	1,405	1,790	—	—
			23/32	3	2	730	955	1,050	1,365	—	—
				4	2	855	1,070	1,210	1,565	—	—
				4	3	1,050	1,430	1,525	1,800	—	—
	14 gage staples	2	15/32	3	2	600	600	860	960	1,060	1,200
				4	3	860	900	1,160	1,295	1,295	1,400
			19/32	3	2	600	600	875	960	1,075	1,200
				4	3	875	900	1,175	1,440	1,475	1,795
Sheathing single floor and other grades covered in DOC PS 1 and PS 2	10d common nails	1 1/2	15/32	3	2	525	725	765	1,010	—	—
				4	2	605	815	875	1,105	—	—
				4	3	765	1,085	1,130	1,195	—	—
			19/32	3	2	650	860	935	1,225	—	—
				4	2	755	965	1,080	1,370	—	—
				4	3	935	1,290	1,365	1,485	—	—
			23/32	3	2	710	935	1,020	1,335	—	—
				4	2	825	1,050	1,175	1,445	—	—
				4	3	1,020	1,400	1,480	1,565	—	—
	14 gage staples	2	15/32	3	2	540	540	735	865	915	1,080
				4	3	735	810	1,005	1,105	1,105	1,195
			19/32	3	2	600	600	865	960	1,065	1,200
				4	3	865	900	1,130	1,430	1,370	1,485
			23/32								
				4	3	865	900	1,130	1,490	1,430	1,545

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- For framing of other species: (1) Find specific gravity for species of framing lumber in AF&PA NDS. (2) For staples, find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails, find shear value from table above for nail size of actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1 - (0.5 - SG)], where SG = Specific gravity of the framing lumber. This adjustment factor shall not be greater than 1.
- Fastening along intermediate framing members: Space fasteners a maximum of 12 inches on center, except 6 inches on center for spans greater than 32 inches.
- Panels conforming to PS 1 or PS 2.
- This table gives shear values for Cases 1 and 2 as shown in Table 2306.2.1(1). The values shown are applicable to Cases 3, 4, 5 and 6 as shown in Table 2306.2.1(1), providing fasteners at all continuous panel edges are spaced in accordance with the boundary fastener spacing.
- The minimum nominal depth of framing members shall be 3 inches nominal. The minimum nominal width of framing members not located at boundaries or adjoining panel edges shall be 2 inches.
- Staples shall have a minimum crown width of 7/16 inch, and shall be installed with their crowns parallel to the long dimension of the framing members.
- High load diaphragms shall be subject to special inspection in accordance with Section 1704.6.1.
- For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

TABLE 2306.2.1(2)—continued  
ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL BLOCKED DIAPHRAGMS  
UTILIZING MULTIPLE ROWS OF FASTENERS (HIGH LOAD DIAPHRAGMS) WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN  
PINE FOR WIND OR SEISMIC LOADING



NOTE: SPACE PANEL END AND EDGE JOINT 1/8-INCH. REDUCE SPACING BETWEEN LINES OF NAILS AS NECESSARY TO MAINTAIN MINIMUM 3/8-INCH FASTENER EDGE MARGINS, MINIMUM SPACING BETWEEN LINES IS 3/8-INCH

**2306.2.2 Single diagonally sheathed lumber diaphragms.** Single diagonally sheathed lumber diaphragms shall be designed and constructed in accordance with AF&PA SDPWS.

**2306.2.3 Double diagonally sheathed lumber diaphragms.** Double diagonally sheathed lumber diaphragms shall be designed and constructed in accordance with AF&PA SDPWS.

**2306.2.4 Gypsum board diaphragm ceilings.** Gypsum board diaphragm ceilings shall be in accordance with Section 2508.5.

**2306.3 Wood structural panel shear walls.** Wood structural panel shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Wood structural panel shear walls are permitted to resist horizontal forces using the allowable capacities set forth in Table 2306.3 Allowable capacities in Table 2306.3 are permitted to be increased 40 percent for wind design.

**TABLE 2306.3**  
**ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH**  
**FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b, h, i, j, l</sup>**

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM FASTENER PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING					PANELS APPLIED OVER $\frac{1}{2}$ OR $\frac{5}{8}$ GYPSUM SHEATHING					
			NAIL (common or galvanized box) or staple size <sup>k</sup>	6	4	3	2 <sup>e</sup>	NAIL (common or galvanized box) or staple size <sup>k</sup>	6	4	3	2 <sup>e</sup>	
Structural I sheathing	$\frac{3}{8}$	$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	230 <sup>d</sup>	360 <sup>d</sup>	460 <sup>d</sup>	610 <sup>d</sup>	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	280	430	550 <sup>f</sup>	730	
		1	1 $\frac{1}{2}$ 16 Gage	155	235	315	400	2 16 Gage	155	235	310	400	
	$\frac{7}{16}$	$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	255 <sup>d</sup>	395 <sup>d</sup>	505 <sup>d</sup>	670 <sup>d</sup>	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	280	430	550 <sup>f</sup>	730	
		1	1 $\frac{1}{2}$ 16 Gage	170	260	345	440	2 16 Gage	155	235	310	400	
	$\frac{15}{32}$	$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	280	430	550	730	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	280	430	550 <sup>f</sup>	730	
		1	1 $\frac{1}{2}$ 16 Gage	185	280	375	475	2 16 Gage	155	235	300	400	
		$1\frac{1}{2}$	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	340	510	665 <sup>f</sup>	870	—	—	—	—	—	
		$1\frac{1}{4}$	6d (2" × 0.113" common, 2" × 0.099" galvanized box)	180	270	350	450	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	180	270	350	450	
	$\frac{5}{16}$ <sup>e</sup> or $\frac{1}{4}$ <sup>e</sup>	1	1 $\frac{1}{2}$ 16 Gage	145	220	295	375	2 16 Gage	110	165	220	285	
		$1\frac{1}{4}$	6d (2" × 0.113" common, 2" × 0.099" galvanized box)	200	300	390	510	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	200	300	390	510	
$1\frac{3}{8}$		8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	220 <sup>d</sup>	320 <sup>d</sup>	410 <sup>d</sup>	530 <sup>d</sup>	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	260	380	490 <sup>f</sup>	640		
1		1 $\frac{1}{2}$ 16 Gage	140	210	280	360	2 16 Gage	140	210	280	360		
Sheathing, plywood siding <sup>e, g</sup> except Group 5 Species	$\frac{7}{16}$	$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	240 <sup>d</sup>	350 <sup>d</sup>	450 <sup>d</sup>	585 <sup>d</sup>	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	260	380	490 <sup>f</sup>	640	
		1	1 $\frac{1}{2}$ 16 Gage	155	230	310	395	2 16 Gage	140	210	280	360	
	$\frac{15}{32}$	$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.131" common, 2 $\frac{1}{2}$ " × 0.113" galvanized box)	260	380	490	640	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	260	380	490 <sup>f</sup>	640	
		$1\frac{1}{2}$	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	310	460	600 <sup>f</sup>	770	—	—	—	—	—	
		1	1 $\frac{1}{2}$ 16 Gage	170	255	335	430	2 16 Gage	140	210	280	360	
		$1\frac{1}{2}$	10d (3" × 0.148" common, 3" × 0.128" galvanized box)	340	510	665 <sup>f</sup>	870	—	—	—	—	—	
	$\frac{19}{32}$	1	1 $\frac{3}{4}$ 16 Gage	185	280	375	475	—	—	—	—	—	
			Nail Size (galvanized casing)					Nail Size (galvanized casing)					
	$\frac{5}{16}$ <sup>e</sup>	$\frac{3}{8}$	$1\frac{1}{4}$	6d (2" × 0.099")	140	210	275	360	8d (2 $\frac{1}{2}$ " × 0.113")	140	210	275	360
			$1\frac{3}{8}$	8d (2 $\frac{1}{2}$ " × 0.113")	160	240	310	410	10d (3" × 0.128")	160	240	310 <sup>f</sup>	410

(continued)



**TABLE 2306.3—continued**  
**ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-  
 LARCH OR SOUTHERN PINE<sup>a</sup> FOR WIND OR SEISMIC LOADING<sup>b, h, i, k, l</sup>**

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

- a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor =  $[1 - (0.5 - SG)]$ , where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.
- b. Panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for  $3/8$ -inch and  $7/16$ -inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.
- c.  $3/8$ -inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied directly to framing as exterior siding. For grooved panel siding, the nominal panel thickness is the thickness of the panel measured at the point of nailing.
- d. Allowable shear values are permitted to be increased to values shown for  $15/32$ -inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.
- e. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails at all panel edges shall be staggered where panel edge nailing is specified at 2 inches on center or less.
- f. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails at all panel edges shall be staggered where both of the following conditions are met: (1) 10d ( $3" \times 0.148"$ ) nails having penetration into framing of more than  $1\frac{1}{2}$  inches and (2) panel edge nailing is specified at 3 inches on center or less.
- g. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.
- h. Where panels are applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members. Or framing shall be 3-inch nominal or thicker at adjoining panel edges and nails at all panel edges shall be staggered.
- i. In Seismic Design Category D, E or F, where shear design values exceed 350 pounds per linear foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch nominal member, or two 2-inch nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered at all panel edges. See Sections 4.3.6.1 and 4.3.6.4.3 of AF&PA SDPWS for sill plate size and anchorage requirements.
- j. Galvanized nails shall be hot dipped or tumbled.
- k. Staples shall have a minimum crown width of  $7/16$  inch and shall be installed with their crowns parallel to the long dimension of the framing members.
- l. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

**2306.4 Lumber sheathed shear walls.** Single and double diagonally sheathed lumber shear walls shall be designed and constructed in accordance with AF&PA SDPWS.

**2306.5 Particleboard shear walls.** Particleboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Particleboard shear walls shall be permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.5. Allowable capacities in Table 2306.5 are permitted to be increased 40 percent for wind design. Particleboard shall not be used to resist seismic forces in structures assigned to Seismic Design Category D.

**2306.6 Fiberboard shear walls.** Fiberboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Fiberboard shear walls are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.6. Allowable capacities in Table 2306.6 are permitted to be increased 40 percent for wind design. Fiberboard shall not be used to resist seismic forces in structures assigned to Seismic Design Category D.

**2306.7 Shear walls sheathed with other materials.** Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall be designed and constructed in accordance with AF&PA SDPWS. Shear walls sheathed with these materials are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.7.

## SECTION BC 2307 LOAD AND RESISTANCE FACTOR DESIGN

**2307.1 Load and resistance factor design.** The structural analysis and construction of wood elements and structures using load and resistance factor design (LRFD) methods shall be in accordance with AF&PA NDS and AF&PA SDPWS.

**2307.1.1 Wood structural panel shear walls.** In Seismic Design Category D, where shear design values exceed 490 pounds per foot (7154 N/m), all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch (76 mm) nominal member or two 2-inch (51 mm) nominal members fastened together in accordance with AF&PA NDS to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered at all panel edges. See Sections 4.3.6.1 and 4.3.6.4.3 of AF&PA SDPWS for sill plate size and anchorage requirements.

## SECTION BC 2308 CONVENTIONAL LIGHT-FRAME CONSTRUCTION

**2308.1 General.** The requirements of this section are intended for conventional light-frame construction. Other methods are permitted to be used provided a satisfactory design is submitted showing compliance with other provisions of this code. Interior non-load-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of this section. Alternatively, compliance with AF&PA WFCM shall be permitted subject to the limitations therein and the limitations of this code.

**2308.1.1 Portions exceeding limitations of conventional construction.** When portions of a building of otherwise conventional construction exceed the limits of Section 2308.2, these portions and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code. For the purposes of this section, the term "portions" shall mean parts of buildings containing volume and area, such as a room or a series of rooms.

**TABLE 2306.5  
ALLOWABLE SHEAR FOR PARTICLEBOARD SHEAR WALL SHEATHING<sup>b</sup>**

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inch)	MINIMUM NAIL PENETRATION IN FRAMING (inches)	PANELS APPLIED DIRECT TO FRAMING				
			Nail size (common or galvanized box)	Allowable shear (pounds per foot) nail spacing at panel edges (inches) <sup>a</sup>			
				6	4	3	2
M-S “Exterior Glue” and M-2 “Exterior Glue”	<sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>	6d	120	180	230	300
	<sup>3</sup> / <sub>8</sub>	1 <sup>1</sup> / <sub>2</sub>		130	190	240	315
	<sup>1</sup> / <sub>2</sub>			140	210	270	350
	<sup>1</sup> / <sub>2</sub>	1 <sup>5</sup> / <sub>8</sub>	10d	185	275	360	460
	<sup>5</sup> / <sub>8</sub>			200	305	395	520

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

a. Values are not permitted in Seismic Design Category D, E or F.

b. Galvanized nails shall be hot-dipped or tumbled.

**TABLE 2306.6  
ALLOWABLE SHEAR VALUES (plf) FOR WIND OR SEISMIC LOADING ON SHEAR WALLS OF FIBERBOARD  
SHEATHING BOARD CONSTRUCTION FOR TYPE V CONSTRUCTION ONLY<sup>a, b, c, d, e</sup>**

THICKNESS AND GRADE	FASTENER SIZE	ALLOWABLE SHEAR VALUE (pounds per linear foot) NAIL SPACING AT PANEL EDGES (inches) <sup>a</sup>		
		4	3	2
$\frac{1}{2}$ " or $\frac{5}{32}$ " Structural	No. 11 gage galvanized roofing nail $1\frac{1}{2}$ " long for $\frac{1}{2}$ ", $1\frac{3}{4}$ " long for $\frac{5}{32}$ " with $\frac{3}{8}$ " head	170	230	260
	No. 11 gage galvanized staple, $\frac{7}{16}$ " crown <sup>f</sup>	150	200	225
	No. 11 gage galvanized staple, 1" crown <sup>f</sup>	220	290	325

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

a. Fiberboard sheathing shall not be used to brace concrete or masonry walls.

b. Panel edges shall be backed with 2-inch or wider framing of Douglas fir-larch or Southern pine. For framing of other species: (1) Find specific gravity for species of framing lumber in AF&PA NDS. (2) For staples, multiply the shear value from the table above by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails, multiply the shear value from the table above by the following adjustment factor: specific gravity adjustment factor =  $[1 - (0.5 \cdot SG)]$ , where SG = Specific gravity of the framing lumber.

c. Values shown are for fiberboard sheathing on one side only with long panel dimension either parallel or perpendicular to studs.

d. Fastener shall be spaced 6 inches on center along intermediate framing members.

e. Values are not permitted in Seismic Design Category D, E or F.

f. Staple length shall not be less than  $1\frac{1}{2}$  inches for  $\frac{5}{32}$ -inch sheathing or  $1\frac{1}{4}$  inches for  $\frac{1}{2}$ -inch sheathing.

**TABLE 2306.7**  
**ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES FOR SHEAR WALLS OF LATH AND PLASTER OR GYPSUM BOARD WOOD**  
**FRAMED WALL ASSEMBLIES**

TYPE OF MATERIAL	THICKNESS OF MATERIAL	WALL CONSTRUCTION	FASTENER SPACING <sup>b</sup> MAXIMUM (inches)	SHEAR VALUE <sup>a, e</sup> (plf)	MINIMUM FASTENER SIZE <sup>c, d, j, k</sup>
1. Expanded metal or woven wire lath and portland cement plaster	$\frac{7}{8}$ "	Unblocked	6	180	No. 11 gage $1\frac{1}{2}$ " long, $\frac{7}{16}$ " head No. 16 gage galv. staple, $\frac{1}{8}$ " legs
2. Gypsum lath, plain or perforated with vertical joints staggered	$\frac{3}{8}$ " lath and $\frac{1}{2}$ " plaster	Unblocked	5	180	No. 13 gage galv. 1" long, $\frac{19}{64}$ " head, plasterboard nail
3. Gypsum lath, plain or perforated	$\frac{3}{8}$ " lath and $\frac{1}{2}$ " plaster	Unblocked	5	100	No. 16 gage galv. staple, $1\frac{1}{8}$ " long, 0.120" nail, min. $\frac{3}{8}$ " head, $1\frac{1}{4}$ " long
4. Gypsum board, gypsum veneer base or water-resistant gypsum backing board	$\frac{1}{2}$ "	Unblocked <sup>f</sup>	7	75	5d cooler ( $1\frac{5}{8}$ " $\times$ 0.086") or wallboard 0.120" nail, min. $\frac{3}{8}$ " head, $1\frac{1}{2}$ " long No. 16 gage galv. staple, $1\frac{1}{2}$ " long
		Unblocked <sup>f</sup>	4	110	
		Unblocked	7	100	
		Unblocked	4	125	
		Blocked <sup>g</sup>	7	125	
		Blocked <sup>g</sup>	4	150	
		Unblocked	8/12 <sup>h</sup>	60	No. 6— $1\frac{1}{4}$ " screws <sup>i</sup>
		Blocked <sup>g</sup>	4/16 <sup>h</sup>	160	
		Blocked <sup>f, g</sup>	4/12 <sup>h</sup>	155	
		Blocked <sup>g</sup>	8/12 <sup>h</sup>	70	
		Blocked <sup>g</sup>	6/12 <sup>h</sup>	90	
	$\frac{5}{8}$ "	Unblocked <sup>f</sup>	7	115	6d cooler ( $1\frac{7}{8}$ " $\times$ 0.092") or Wallboard 0.120" nail, min. $\frac{3}{8}$ " head, $1\frac{3}{4}$ " long No. 16 gage galv. staple, $1\frac{1}{2}$ " legs, $1\frac{5}{8}$ " long
			4	145	
		Blocked <sup>g</sup>	7	145	
			4	175	
		Blocked <sup>g</sup> Two-ply	Base ply: 9 Face ply: 7	250	Base ply-6d cooler ( $1\frac{7}{8}$ " $\times$ 0.092") or wallboard $1\frac{3}{4}$ " $\times$ 0.120" nail, min. $\frac{3}{8}$ " head $1\frac{5}{8}$ " 16 gage galv. staple $1\frac{5}{8}$ " 16 gage galv. staple Face ply-8d cooler ( $2\frac{3}{8}$ " $\times$ 0.113") or wallboard 0.120" nail, min. $\frac{3}{8}$ " head, $2\frac{3}{8}$ " long No. 15 gage galv. staple, $2\frac{1}{4}$ " long
		Unblocked	8/12 <sup>h</sup>	70	No. 6— $1\frac{1}{4}$ " screws <sup>i</sup>
		Blocked <sup>g</sup>	8/12 <sup>h</sup>	90	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per foot = 14.5939 N/m.

- These shear walls shall not be used to resist loads imposed by masonry or concrete walls (see Section 4.1.5 of AF&PA SDPWS). Values shown are for short-term loading due to wind or seismic loading. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7. Values shown shall be reduced 25 percent for normal loading.
- Applies to fastening at studs, top and bottom plates and blocking.
- Alternate fasteners are permitted to be used if their dimensions are not less than the specified dimensions. Drywall screws are permitted to substitute for the 5d ( $1\frac{5}{8}$ "  $\times$  0.086"), and 6d ( $1\frac{7}{8}$ "  $\times$  0.092") (cooler) nails listed above, and No. 6  $1\frac{1}{4}$ " inch Type S or W screws for 6d ( $1\frac{7}{8}$ "  $\times$  0.092") (cooler) nails.
- For properties of cooler nails, see ASTM C 514.
- Except as noted, shear values are based on a maximum framing spacing of 16 inches on center.
- Maximum framing spacing of 24 inches on center.
- All edges are blocked, and edge fastening is provided at all supports and all panel edges.
- First number denotes fastener spacing at the edges; second number denotes fastener spacing at intermediate framing members.
- Screws are Type W or S.
- Staples shall have a minimum crown width of  $\frac{7}{16}$ " inch, measured outside the legs, and shall be installed with their crowns parallel to the long dimension of the framing members.
- Staples for the attachment of gypsum lath and woven-wire lath shall have a minimum crown width of  $\frac{3}{4}$ " inch, measured outside the legs.

**2308.2 Limitations.** Buildings are permitted to be constructed in accordance with the provisions of Section 2308 for conventional light-frame construction, subject to the following limitations, and to further limitations of Sections 2308.11 and 2308.12:

1. Buildings shall be limited to a maximum of three stories above grade plane. For the purposes of this section, for buildings in Seismic Design Category D as determined in Section 1613, cripple stud walls shall be considered to be a story.

**Exception:** Solid blocked cripple walls not exceeding 14 inches (356 mm) in height need not be considered a story.

2. Maximum floor-to-floor height shall not exceed 11 feet, 7 inches (3531 mm). Bearing wall height shall not exceed a stud height of 10 feet (3048 mm).
3. Loads as determined in Chapter 16 shall not exceed the following:
  - 3.1. Average dead loads shall not exceed 15 psf (718 N/m<sup>2</sup>) for combined roof and ceiling, exterior walls, floors and partitions.

**Exceptions:**

1. Subject to the limitations of Sections 2308.11.2 and 2308.12.2, stone or masonry veneer up to the lesser of 5 inches (127 mm) thick or 50 psf (2395 N/m<sup>2</sup>) and installed in accordance with Chapter 14 is permitted to a height of 30 feet (9144 mm) above a noncombustible foundation, with an additional 8 feet (2438 mm) permitted for gable ends.
2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance with the provisions of this code.
- 3.2. Live loads shall not exceed 40 psf (1916 N/m<sup>2</sup>) for floors.
- 3.3. Ground snow loads shall not exceed 50 psf (2395 N/m<sup>2</sup>).
4. Wind speeds shall not exceed 100 miles per hour (mph)(44 m/s) (3-second gust).
 

**Exception:** Wind speeds shall not exceed 110 mph (48.4 m/s) (3-second gust) for buildings in Exposure Category A or B that are not located in a hurricane-prone region.
5. Roof trusses and rafters shall not span more than 40 feet (12 192 mm) between points of vertical support.
6. The use of the provisions for conventional light-frame construction in this section shall not be permitted for Occupancy Category IV buildings assigned to Seismic Design Category B, C, or D, as determined in Section 1613.
7. Conventional light-frame construction is limited in irregular structures in Seismic Design Category D, as specified in Section 2308.12.6.

**2308.2.1 Basic wind speed greater than 100 mph (3-second gust).** Where the basic wind speed exceeds 100 mph (3-second gust), the provisions of either AF&PA WFCM or ICC 600 are permitted to be used.

**2308.2.2 Buildings in Seismic Design Category B, C, or D.** Buildings of conventional light-frame construction in Seismic Design Category B or C, as determined in Section 1613, shall comply with the additional requirements in Section 2308.11. Buildings of conventional light-frame construction in Seismic Design Category D, as determined in Section 1613, shall comply with the additional requirements in Section 2308.12.

**2308.3 Braced wall lines.** Buildings shall be provided with exterior and interior braced wall lines as described in Section 2308.9.3 and installed in accordance with Sections 2308.3.1 through 2308.3.4.

**2308.3.1 Spacing.** Spacing of braced wall lines shall not exceed 35 feet (10 668 mm) o.c. in both the longitudinal and transverse directions in each story.

**2308.3.2 Braced wall line connections.** Wind and seismic lateral forces shall be transferred from the roofs and floors to braced wall lines and from the braced wall lines in upper stories to the braced wall lines in the story below in accordance with this section. Braced wall line top plates shall be fastened to joists, rafters or full-depth blocking above in accordance with Table 2304.9.1, Items 11, 12, 15 or 19 as applicable based on the orientation of the joists or rafters to the braced wall line. Braced wall line bottom plates shall be connected to joists or blocking below in accordance with Table 2304.9.1, Item 6, or to foundations in accordance with Section 2308.3.3. At exterior gable end walls, braced wall panel sheathing in the top story shall be extended and fastened to roof framing where the spacing between parallel exterior braced wall lines is greater than 50 feet (15 240 mm).

**Exception:** Where roof trusses are used and are installed perpendicular to an exterior braced wall line, lateral forces shall be transferred from the roof diaphragm to the braced wall by blocking of the ends of the trusses or by other approved methods providing equivalent lateral force transfer. Blocking shall be a minimum of 2 inches (51 mm) nominal in thickness and equal to the depth of the truss at the wall line and shall be fastened to the braced wall line top plate as specified in Table 2304.9.1, Item 11.

**2308.3.3 Sill anchorage.** Where foundations are required by Section 2308.3.4, braced wall line sills shall be anchored to concrete or masonry foundations. Such anchorage shall conform to the requirements of Section 2308.6, except that such anchors shall be spaced at not more than 4 feet (1219 mm) o.c. for structures over two stories above grade plane. The anchors shall be distributed along the length of the braced wall line. Other anchorage devices having equivalent capacity are permitted.

**2308.3.3.1 Anchorage to all-wood foundations.** Where all-wood foundations are used, the force transfer from the braced wall lines shall be determined



based on calculation and shall have a capacity greater than or equal to the connections required by Section 2308.3.3.

**2308.3.4 Braced wall line support.** Braced wall lines shall be supported by continuous foundations.

**Exception:** For structures with a maximum plan dimension not over 50 feet (15 240 mm), continuous foundations are required at exterior walls only.

**2308.4 Design of elements.** Combining of engineered elements or systems and conventionally specified elements or systems is permitted subject to the following limits:

**2308.4.1 Elements exceeding limitations of conventional construction.** When a building of otherwise conventional construction contains structural elements exceeding the limits of Section 2308.2, these elements and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code.

**2308.4.2 Structural elements or systems not described herein.** When a building of otherwise conventional construction contains structural elements or systems not described in Section 2308, these elements or systems shall be designed in accordance with accepted engineering practice and the provisions of this code. The extent of such design need only demonstrate compliance of the nonconventional elements with other applicable provisions of this code and shall be compatible with the performance of the conventionally framed system.

**2308.5 Connections and fasteners.** Connections and fasteners used in conventional construction shall comply with the requirements of Section 2304.9.

**2308.6 Foundation plates or sills.** Foundations and footings shall be as specified in Chapter 18. Foundation plates or sills resting on concrete or masonry foundations shall comply with Section 2304.3.1. Foundation plates or sills shall be bolted or anchored to the foundation with not less than  $\frac{1}{2}$ -inch-diameter (12.7 mm) steel bolts or approved anchors spaced to provide equivalent anchorage as the steel bolts. Bolts shall be embedded at least 7 inches (178 mm) into concrete or masonry, and spaced not more than 6 feet (1829 mm) apart. There shall be a minimum of two bolts or anchor straps per piece with one bolt or anchor strap located not more than 12 inches (305 mm) or less than 4 inches (102 mm) from each end of each piece. A properly sized nut and washer shall be tightened on each bolt to the plate.

**2308.7 Girders.** Girders for single-story construction or girders supporting loads from a single floor shall not be less than 4 inches by 6 inches (102 mm by 152 mm) for spans 6 feet (1829 mm) or less, provided that girders are spaced not more than 8 feet (2438 mm) o.c. Spans for built-up 2-inch (51 mm) girders shall be in accordance with Table 2308.9.5 or 2308.9.6. Other girders shall be designed to support the loads specified in this code. Girder end joints shall occur over supports. Where a girder is spliced over a sup-

port, an adequate tie shall be provided. The ends of beams or girders supported on masonry or concrete shall not have less than 3 inches (76 mm) of bearing.

**2308.8 Floor joists.** Spans for floor joists shall be in accordance with Table 2308.8(1) or 2308.8(2). For other grades and or species, refer to the AF&PA Span Tables for Joists and Rafters.

**2308.8.1 Bearing.** Except where supported on a 1-inch by 4-inch (25.4 mm by 102 mm) ribbon strip and nailed to the adjoining stud, the ends of each joist shall not have less than  $1\frac{1}{2}$  inches (38 mm) of bearing on wood or metal, or less than 3 inches (76 mm) on masonry.

**2308.8.2 Framing details.** Joists shall be supported laterally at the ends and at each support by solid blocking except where the ends of the joists are nailed to a header, band or rim joist or to an adjoining stud or by other means. Solid blocking shall not be less than 2 inches (51 mm) in thickness and the full depth of the joist. Notches on the ends of joists shall not exceed one-fourth the joist depth. Holes bored in joists shall not be within 2 inches (51 mm) of the top or bottom of the joist, and the diameter of any such hole shall not exceed one-third the depth of the joist. Notches in the top or bottom of joists shall not exceed one-sixth the depth and shall not be located in the middle third of the span. Joist framing from opposite sides of a beam, girder or partition shall be lapped at least 3 inches (76 mm) or the opposing joists shall be tied together in an approved manner. Joists framing into the side of a wood girder shall be supported by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).

**2308.8.2.1 Engineered wood products.** Cuts, notches and holes bored in trusses, structural composite lumber, structural glue-laminated members or I-joists are not permitted except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

**2308.8.3 Framing around openings.** Trimmer and header joists shall be doubled, or of lumber of equivalent cross section, where the span of the header exceeds 4 feet (1219 mm). The ends of header joists more than 6 feet (1829 mm) long shall be supported by framing anchors or joist hangers unless bearing on a beam, partition or wall. Tail joists over 12 feet (3658 mm) long shall be supported at the header by framing anchors or on ledger strips not less than 2 inches by 2 inches (51 mm by 51 mm).

**2308.8.4 Supporting bearing partitions.** Bearing partitions parallel to joists shall be supported on beams, girders, doubled joists, walls or other bearing partitions. Bearing partitions perpendicular to joists shall not be offset from supporting girders, walls or partitions more than the joist depth unless such joists are of sufficient size to carry the additional load.

**TABLE 2308.8(1)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Residential Sleeping Areas, Live Load = 30 psf, L/Δ = 360)

JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	12-6	16-6	21-0	25-7	12-6	16-6	21-0	25-7
	Douglas Fir-Larch	#1	12-0	15-10	20-3	24-8	12-0	15-7	19-0	22-0
	Douglas Fir-Larch	#2	11-10	15-7	19-10	23-0	11-6	14-7	17-9	20-7
	Douglas Fir-Larch	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Hem-Fir	SS	11-10	15-7	19-10	24-2	11-10	15-7	19-10	24-2
	Hem-Fir	#1	11-7	15-3	19-5	23-7	11-7	15-2	18-6	21-6
	Hem-Fir	#2	11-0	14-6	18-6	22-6	11-0	14-4	17-6	20-4
	Hem-Fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Southern Pine	SS	12-3	16-2	20-8	25-1	12-3	16-2	20-8	25-1
	Southern Pine	#1	12-0	15-10	20-3	24-8	12-0	15-10	20-3	24-8
	Southern Pine	#2	11-10	15-7	19-10	24-2	11-10	15-7	18-7	21-9
	Southern Pine	#3	10-5	13-3	15-8	18-8	9-4	11-11	14-0	16-8
	Spruce-Pine-Fir	SS	11-7	15-3	19-5	23-7	11-7	15-3	19-5	23-7
	Spruce-Pine-Fir	#1	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-Pine-Fir	#2	11-3	14-11	19-0	23-0	11-3	14-7	17-9	20-7
	Spruce-Pine-Fir	#3	9-8	12-4	15-0	17-5	8-8	11-0	13-5	15-7
16	Douglas Fir-Larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-0
	Douglas Fir-Larch	#1	10-11	14-5	18-5	21-4	10-8	13-6	16-5	19-1
	Douglas Fir-Larch	#2	10-9	14-1	17-2	19-11	9-11	12-7	15-5	17-10
	Douglas Fir-Larch	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
	Hem-Fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-Fir	#1	10-6	13-10	17-8	20-9	10-4	13-1	16-0	18-7
	Hem-Fir	#2	10-0	13-2	16-10	19-8	9-10	12-5	15-2	17-7
	Hem-Fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
	Southern Pine	SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern Pine	#1	10-11	14-5	18-5	22-5	10-11	14-5	17-11	21-4
	Southern Pine	#2	10-9	14-2	18-0	21-1	10-5	13-6	16-1	18-10
	Southern Pine	#3	9-0	11-6	13-7	16-2	8-1	10-3	12-2	14-6
	Spruce-Pine-Fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-4
	Spruce-Pine-Fir	#1	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-Pine-Fir	#2	10-3	13-6	17-2	19-11	9-11	12-7	15-5	17-10
	Spruce-Pine-Fir	#3	8-5	10-8	13-0	15-1	7-6	9-6	11-8	13-6
19.2	Douglas Fir-Larch	SS	10-8	14-1	18-0	21-10	10-8	14-1	18-0	21-0
	Douglas Fir-Larch	#1	10-4	13-7	16-9	19-6	9-8	12-4	15-0	17-5
	Douglas Fir-Larch	#2	10-1	12-10	15-8	18-3	9-1	11-6	14-1	16-3
	Douglas Fir-Larch	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4
	Hem-Fir	SS	10-1	13-4	17-0	20-8	10-1	13-4	17-0	20-7
	Hem-Fir	#1	9-10	13-0	16-4	19-0	9-6	12-0	14-8	17-0
	Hem-Fir	#2	9-5	12-5	15-6	17-1	8-11	11-4	13-10	16-1
	Hem-Fir	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4

(continued)

**TABLE 2308.8(1)—continued**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
**(Residential Sleeping Areas, Live Load = 30 psf,  $L/\Delta = 360$ )**

JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Southern Pine	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Southern Pine	#1	10-4	13-7	17-4	21-1	10-4	13-7	16-4	19-6
	Southern Pine	#2	10-1	13-4	16-5	19-3	9-6	12-4	14-8	17-2
	Southern Pine	#3	8-3	10-6	12-5	14-9	7-4	9-5	11-1	13-2
	Spruce-Pine-Fir	SS	9-10	13-0	16-7	20-2	9-10	13-0	16-7	19-6
	Spruce-Pine-Fir	#1	9-8	12-9	15-8	18-3	9-1	11-6	14-1	16-3
	Spruce-Pine-Fir	#2	9-8	12-9	15-8	18-3	9-1	11-6	14-1	16-3
	Spruce-Pine-Fir	#3	7-8	9-9	11-10	13-9	6-10	8-8	10-7	12-4
24	Douglas Fir-Larch	SS	9-11	13-1	16-8	20-3	9-11	13-1	16-2	18-9
	Douglas Fir-Larch	#1	9-7	12-4	15-0	17-5	8-8	11-0	13-5	15-7
	Douglas Fir-Larch	#2	9-1	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Douglas Fir-Larch	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0
	Hem-Fir	SS	9-4	12-4	15-9	19-2	9-4	12-4	15-9	18-5
	Hem-Fir	#1	9-2	12-0	14-8	17-0	8-6	10-9	13-1	15-2
	Hem-Fir	#2	8-9	11-4	13-10	16-1	8-0	10-2	12-5	14-4
	Hem-Fir	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0
	Southern Pine	SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Southern Pine	#1	9-7	12-7	16-1	19-6	9-7	12-4	14-7	17-5
	Southern Pine	#2	9-4	12-4	14-8	17-2	8-6	11-0	13-1	15-5
	Southern Pine	#3	7-4	9-5	11-1	13-2	6-7	8-5	9-11	11-10
	Spruce-Pine-Fir	SS	9-2	12-1	15-5	18-9	9-2	12-1	15-0	17-5
	Spruce-Pine-Fir	#1	8-11	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Spruce-Pine-Fir	#2	8-11	11-6	14-1	16-3	8-1	10-3	12-7	14-7
	Spruce-Pine-Fir	#3	6-10	8-8	10-7	12-4	6-2	7-9	9-6	11-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m

**TABLE 2308.8(2)**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Residential Living Areas, Live Load = 40 psf, L/Δ = 360)

JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
			2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
			Maximum floor joist spans							
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	11-4	15-0	19-1	23-3	11-4	15-0	19-1	23-3
	Douglas Fir-Larch	#1	10-11	14-5	18-5	22-0	10-11	14-2	17-4	20-1
	Douglas Fir-Larch	#2	10-9	14-2	17-9	20-7	10-6	13-3	16-3	18-10
	Douglas Fir-Larch	#3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Hem-Fir	SS	10-9	14-2	18-0	21-11	10-9	14-2	18-0	21-11
	Hem-Fir	#1	10-6	13-10	17-8	21-6	10-6	13-10	16-11	19-7
	Hem-Fir	#2	10-0	13-2	16-10	20-4	10-0	13-1	16-0	18-6
	Hem-Fir	#3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Southern Pine	SS	11-2	14-8	18-9	22-10	11-2	14-8	18-9	22-10
	Southern Pine	#1	10-11	14-5	18-5	22-5	10-11	14-5	18-5	22-5
	Southern Pine	#2	10-9	14-2	18-0	21-9	10-9	14-2	16-11	19-10
	Southern Pine	#3	9-4	11-11	14-0	16-8	8-6	10-10	12-10	15-3
	Spruce-Pine-Fir	SS	10-6	13-10	17-8	21-6	10-6	13-10	17-8	21-6
	Spruce-Pine-Fir	#1	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-Pine-Fir	#2	10-3	13-6	17-3	20-7	10-3	13-3	16-3	18-10
	Spruce-Pine-Fir	#3	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
16	Douglas Fir-Larch	SS	10-4	13-7	17-4	21-1	10-4	13-7	17-4	21-0
	Douglas Fir-Larch	#1	9-11	13-1	16-5	19-1	9-8	12-4	15-0	17-5
	Douglas Fir-Larch	#2	9-9	12-7	15-5	17-10	9-1	11-6	14-1	16-3
	Douglas Fir-Larch	#3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Hem-Fir	SS	9-9	12-10	16-5	19-11	9-9	12-10	16-5	19-11
	Hem-Fir	#1	9-6	12-7	16-0	18-7	9-6	12-0	14-8	17-0
	Hem-Fir	#2	9-1	12-0	15-2	17-7	8-11	11-4	13-10	16-1
	Hem-Fir	#3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
	Southern Pine	SS	10-2	13-4	17-0	20-9	10-2	13-4	17-0	20-9
	Southern Pine	#1	9-11	13-1	16-9	20-4	9-11	13-1	16-4	19-6
	Southern Pine	#2	9-9	12-10	16-1	18-10	9-6	12-4	14-8	17-2
	Southern Pine	#3	8-1	10-3	12-2	14-6	7-4	9-5	11-1	13-2
	Spruce-Pine-Fir	SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Spruce-Pine-Fir	#1	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-Pine-Fir	#2	9-4	12-3	15-5	17-10	9-1	11-6	14-1	16-3
	Spruce-Pine-Fir	#3	7-6	9-6	11-8	13-6	6-10	8-8	10-7	12-4
19.2	Douglas Fir-Larch	SS	9-8	12-10	16-4	19-10	9-8	12-10	16-4	19-2
	Douglas Fir-Larch	#1	9-4	12-4	15-0	17-5	8-10	11-3	13-8	15-11
	Douglas Fir-Larch	#2	9-1	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Douglas Fir-Larch	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Hem-Fir	SS	9-2	12-1	15-5	18-9	9-2	12-1	15-5	18-9
	Hem-Fir	#1	9-0	11-10	14-8	17-0	8-8	10-11	13-4	15-6
	Hem-Fir	#2	8-7	11-3	13-10	16-1	8-2	10-4	12-8	14-8
	Hem-Fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3
	Southern Pine	SS	9-6	12-7	16-0	19-6	9-6	12-7	16-0	19-6
	Southern Pine	#1	9-4	12-4	15-9	19-2	9-4	12-4	14-11	17-9
	Southern Pine	#2	9-2	12-1	14-8	17-2	8-8	11-3	13-5	15-8
	Southern Pine	#3	7-4	9-5	11-1	13-2	6-9	8-7	10-1	12-1
	Spruce-Pine-Fir	SS	9-0	11-10	15-1	18-4	9-0	11-10	15-1	17-9
	Spruce-Pine-Fir	#1	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-Pine-Fir	#2	8-9	11-6	14-1	16-3	8-3	10-6	12-10	14-10
	Spruce-Pine-Fir	#3	6-10	8-8	10-7	12-4	6-3	7-11	9-8	11-3

(continued)



**TABLE 2308.8(2)—continued**  
**FLOOR JOIST SPANS FOR COMMON LUMBER SPECIES**  
**(Residential Living Areas, Live Load = 40 psf, L/Δ = 360)**

JOIST SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 psf				DEAD LOAD = 20 psf			
		2x6	2x8	2x10	2x12	2x6	2x8	2x10	2x12
		Maximum floor joist spans							
		(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
24	Douglas Fir-Larch SS	9-0	11-11	15-2	18-5	9-0	11-11	14-9	17-1
	Douglas Fir-Larch #1	8-8	11-0	13-5	15-7	7-11	10-0	12-3	14-3
	Douglas Fir-Larch #2	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Douglas Fir-Larch #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1
	Hem-Fir SS	8-6	11-3	14-4	17-5	8-6	11-3	14-4	16-10 <sup>a</sup>
	Hem-Fir #1	8-4	10-9	13-1	15-2	7-9	9-9	11-11	13-10
	Hem-Fir #2	7-11	10-2	12-5	14-4	7-4	9-3	11-4	13-1
	Hem-Fir #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1
	Southern Pine SS	8-10	11-8	14-11	18-1	8-10	11-8	14-11	18-1
	Southern Pine #1	8-8	11-5	14-7	17-5	8-8	11-3	13-4	15-11
	Southern Pine #2	8-6	11-0	13-1	15-5	7-9	10-0	12-0	14-0
	Southern Pine #3	6-7	8-5	9-11	11-10	6-0	7-8	9-1	10-9
	Spruce-Pine-Fir SS	8-4	11-0	14-0	17-0	8-4	11-0	13-8	15-11
	Spruce-Pine-Fir #1	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-Pine-Fir #2	8-1	10-3	12-7	14-7	7-5	9-5	11-6	13-4
	Spruce-Pine-Fir #3	6-2	7-9	9-6	11-0	5-7	7-1	8-8	10-1

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m<sup>2</sup>.

a. End bearing length shall be increased to 2 inches.

**2308.8.5 Lateral support.** Floor, attic and roof framing with a nominal depth-to-thickness ratio greater than or equal to 5:1 shall have one edge held in line for the entire span. Where the nominal depth-to-thickness ratio of the framing member exceeds 6:1, there shall be one line of bridging for each 8 feet (2438 mm) of span, unless both edges of the member are held in line. The bridging shall consist of not less than 1-inch by 3-inch (25 mm by 76 mm) lumber, double nailed at each end, of equivalent metal bracing of equal rigidity, full-depth solid blocking or other approved means. A line of bridging shall also be required at supports where equivalent lateral support is not otherwise provided.

**2308.8.6 Structural floor sheathing.** Structural floor sheathing shall comply with the provisions of Section 2304.7.1.

**2308.8.7 Under-floor ventilation.** For under-floor ventilation, see Section 1203.3.

### 2308.9 Wall framing.

**2308.9.1 Size, height and spacing.** The size, height and spacing of studs shall be in accordance with Table 2308.9.1 except that utility-grade studs shall not be spaced more than 16 inches (406 mm) o.c., or support more than a roof and ceiling, or exceed 8 feet (2438 mm) in height for exterior walls and load-bearing walls or 10 feet (3048 mm) for interior nonload-bearing walls. Studs shall be continuous from a support at the sole plate to a support at the top plate to resist loads perpendicular to the wall. The support shall be a foundation or floor, ceiling or roof diaphragm or shall be designed in accordance with accepted engineering practice.

**Exception:** Jack studs, trimmer studs and cripple studs at openings in walls that comply with Table 2308.9.5.

**2308.9.2 Framing details.** Studs shall be placed with their wide dimension perpendicular to the wall. Not less than three studs shall be installed at each corner of an exterior wall.

**Exception:** At corners, two studs are permitted, provided wood spacers or backup cleats of <sup>3</sup>/<sub>8</sub>-inch-thick (9.5 mm) wood structural panel, <sup>3</sup>/<sub>8</sub>-inch (9.5 mm) Type M “Exterior Glue” particleboard, 1-inch-thick (25 mm) lumber or other approved devices that will serve as an adequate backing for the attachment of facing materials are used. Where fire-resistance ratings or shear values are involved, wood spacers, backup cleats or other devices shall not be used unless specifically approved for such use.

**2308.9.2.1 Top plates.** Bearing and exterior wall studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with other partitions. End joints in double top plates shall be offset at least 48 inches (1219 mm), and shall be nailed with not less than eight 16d face nails on each side of the joint. Plates shall be a nominal 2 inches (51 mm) in depth and have a width at least equal to the width of the studs.

**Exception:** A single top plate is permitted, provided the plate is adequately tied at joints, corners and intersecting walls by at least the equivalent of 3-inch by 6-inch (76 mm by 152 mm) by 0.036-inch-thick (0.914 mm) galvanized steel that is nailed to each wall or segment of wall by six 8d nails or

**TABLE 2308.9.1  
SIZE, HEIGHT AND SPACING OF WOOD STUDS**

STUD SIZE (inches)	BEARING WALLS				NONBEARING WALLS	
	Laterally unsupported stud height <sup>a</sup> (feet)	Supporting roof and ceiling only	Supporting one floor, roof and ceiling	Supporting two floors, roof and ceiling	Laterally unsupported stud height <sup>a</sup> (feet)	Spacing (inches)
	Spacing (inches)					
2 × 3 <sup>b</sup>	—	—	—	—	10	16
2 × 4	10	24	16	—	14	24
3 × 4	10	24	24	16	14	24
2 × 5	10	24	24	—	16	24
2 × 6	10	24	24	16	20	24

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Listed heights are distances between points of lateral support placed perpendicular to the plane of the wall. Increases in unsupported height are permitted where justified by an analysis.
- b. Shall not be used in exterior walls.

equivalent, provided the rafters, joists or trusses are centered over the studs with a tolerance of no more than 1 inch (25 mm).

**2308.9.2.2 Top plates for studs spaced at 24 inches (610 mm).** Where bearing studs are spaced at 24-inch (610 mm) intervals and top plates are less than two 2-inch by 6-inch (51 mm by 152 mm) or two 3-inch by 4-inch (76 mm by 102 mm) members and where the floor joists, floor trusses or roof trusses that they support are spaced at more than 16-inch (406 mm) intervals, such joists or trusses shall bear within 5 inches (127 mm) of the studs beneath or a third plate shall be installed.

**2308.9.2.3 Nonbearing walls and partitions.** In nonbearing walls and partitions, studs shall be spaced not more than 28 inches (711 mm) o.c. and are permitted to be set with the long dimension parallel to the wall. Interior nonbearing partitions shall be capped with no less than a single top plate installed to provide overlapping at corners and at intersections with other walls and partitions. The plate shall be continuously tied at joints by solid blocking at least 16 inches (406 mm) in length and equal in size to the plate or by 1/2-inch by 1 1/2-inch (12.7 mm by 38 mm) metal ties with spliced sections fastened with two 16d nails on each side of the joint.

**2308.9.2.4 Plates or sills.** Studs shall have full bearing on a plate or sill not less than 2 inches (51 mm) in thickness having a width not less than that of the wall studs.

**2308.9.3 Bracing.** Braced wall lines shall consist of braced wall panels that meet the requirements for location, type and amount of bracing as shown in Figure 2308.9.3, specified in Table 2308.9.3(1), and are in line or offset from each other by not more than 4 feet (1219 mm). Braced wall panels shall start not more than 12 1/2 feet (3810 mm)

from each end of a braced wall line. Braced wall panels shall be clearly indicated on the plans. Construction of braced wall panels shall be by one of the following methods:

1. Nominal 1-inch by 4-inch (25 mm by 102 mm) continuous diagonal braces let into top and bottom plates and intervening studs, placed at an angle not more than 60 degrees (1.0 rad) or less than 45 degrees (0.79 rad) from the horizontal and attached to the framing in conformance with Table 2304.9.1.
2. Wood boards of 5/8 inch (15.9 mm) net minimum thickness applied diagonally on studs spaced not over 24 inches (610 mm) o.c.
3. Wood structural panel sheathing with a thickness not less than 3/8 inch (9.5 mm) for 16-inch (406 mm) or 24-inch (610 mm) stud spacing in accordance with Tables 2308.9.3(2) and 2308.9.3(3).
4. Fiberboard sheathing panels not less than 1/2 inch (12.7 mm) thick applied vertically or horizontally on studs spaced not over 16 inches (406 mm) o.c. where installed with fasteners in accordance with Section 2306.6 and Table 2306.6.
5. Gypsum board [sheathing 1/2-inch-thick (12.7 mm) by 4-feet-wide (1219 mm) wallboard or veneer base] on studs spaced not over 24 inches (610 mm) o.c. and nailed at 7 inches (178 mm) o.c. with nails as required by Table 2306.7.
6. Particleboard wall sheathing panels where installed in accordance with Table 2308.9.3(4).
7. Portland cement plaster on studs spaced 16 inches (406 mm) o.c. installed in accordance with Section 2510.
8. Hardboard panel siding where installed in accordance with Section 2303.1.6 and Table 2308.9.3(5).

**TABLE 2308.9.3(1)  
BRACED WALL PANELS<sup>a</sup>**

SEISMIC DESIGN CATEGORY	CONDITION	CONSTRUCTION METHODS <sup>b, c</sup>								BRACED PANEL LOCATION AND LENGTH <sup>d</sup>
		1	2	3	4	5	6	7	8	
A and B	One story, top of two or three story	X	X	X	X	X	X	X	X	Located in accordance with Section 2308.9.3 and not more than 25 feet on center.
	First story of two story or second story of three story	X	X	X	X	X	X	X	X	
	First story of three story	—	X	X	X	X <sup>e</sup>	X	X	X	
C	One story or top of two story	—	X	X	X	X	X	X	X	Located in accordance with Section 2308.9.3 and not more than 25 feet on center.
	First story of two story	—	X	X	X	X <sup>e</sup>	X	X	X	Located in accordance with Section 2308.9.3 and not more than 25 feet on center, but total length shall not be less than 25% of building length <sup>f</sup> .

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. This table specifies minimum requirements for braced panels that form interior or exterior braced wall lines.  
b. See Section 2308.9.3 for full description.  
c. See Sections 2308.9.3.1 and 2308.9.3.2 for alternative braced panel requirements.  
d. Building length is the dimension parallel to the braced wall length.  
e. Gypsum wallboard applied to framing supports that are spaced at 16 inches on center.  
f. The required lengths shall be doubled for gypsum board applied to only one face of a braced wall panel.

**TABLE 2308.9.3(2)  
EXPOSED PLYWOOD PANEL SIDING**

MINIMUM THICKNESS <sup>a</sup> (inch)	MINIMUM NUMBER OF PLIES	STUD SPACING (inches) Plywood siding applied directly to studs or over sheathing
$\frac{3}{8}$	3	16 <sup>b</sup>
$\frac{1}{2}$	4	24

For SI: 1 inch = 25.4 mm.

- a. Thickness of grooved panels is measured at bottom of grooves.  
b. Spans are permitted to be 24 inches if plywood siding applied with face grain perpendicular to studs or over one of the following: (1) 1-inch board sheathing, (2)  $\frac{7}{16}$ -inch wood structural panel sheathing or (3)  $\frac{3}{8}$ -inch wood structural panel sheathing with strength axis (which is the long direction of the panel unless otherwise marked) of sheathing perpendicular to studs.

**TABLE 2308.9.3(3)  
WOOD STRUCTURAL PANEL WALL SHEATHING<sup>b</sup>  
(Not Exposed to the Weather, Strength Axis Parallel or Perpendicular to Studs Except as Indicated Below)**

MINIMUM THICKNESS (inch)	PANEL SPAN RATING	STUD SPACING (inches)		
		Siding nailed to studs	Nailable sheathing	
			Sheathing parallel to studs	Sheathing perpendicular to studs
$\frac{3}{8}$ , $\frac{15}{32}$ , $\frac{1}{2}$	16/0, 20/0, 24/0, 32/16 Wall—24" o.c.	24	16	24
$\frac{7}{16}$ , $\frac{15}{32}$ , $\frac{1}{2}$	24/0, 24/16, 32/16 Wall—24" o.c.	24	24 <sup>a</sup>	24

For SI: 1 inch = 25.4 mm.

- a. Plywood shall consist of four or more plies.  
b. Blocking of horizontal joints shall not be required except as specified in Sections 2306.3 and 2308.12.4.

**TABLE 2308.9.3(4)  
ALLOWABLE SPANS FOR PARTICLEBOARD WALL SHEATHING  
(Not Exposed to the Weather, Long Dimension of the Panel Parallel or Perpendicular to Studs)**

GRADE	THICKNESS (inch)	STUD SPACING (inches)	
		Siding nailed to studs	Sheathing under coverings specified in Section 2308.9.3 parallel or perpendicular to studs
M-S "Exterior Glue" and M-2 "Exterior Glue"	$\frac{3}{8}$	16	—
	$\frac{1}{2}$	16	16

For SI: 1 inch = 25.4 mm.

**TABLE 2308.9.3(5)  
HARDBOARD SIDING**

SIDING	MINIMUM NOMINAL THICKNESS (inch)	2 x 4 FRAMING MAXIMUM SPACING	NAIL SIZE <sup>a, b, d</sup>	NAIL SPACING	
				General	Bracing panels <sup>e</sup>
1. Lap siding					
Direct to studs	<sup>3</sup> / <sub>8</sub>	16'' o.c.	8d	16'' o.c.	Not applicable
Over sheathing	<sup>3</sup> / <sub>8</sub>	16'' o.c.	10d	16'' o.c.	Not applicable
2. Square edge panel siding					
Direct to studs	<sup>3</sup> / <sub>8</sub>	24'' o.c.	6d	6'' o.c. edges; 12'' o.c. at intermediate supports	4'' o.c. edges; 8'' o.c. at intermediate supports
Over sheathing	<sup>3</sup> / <sub>8</sub>	24'' o.c.	8d	6'' o.c. edges; 12'' o.c. at intermediate supports	4'' o.c. edges; 8'' o.c. at intermediate supports
3. Shiplap edge panel siding					
Direct to studs	<sup>3</sup> / <sub>8</sub>	16'' o.c.	6d	6'' o.c. edges; 12'' o.c. at intermediate supports	4'' o.c. edges; 8'' o.c. at intermediate supports
Over sheathing	<sup>3</sup> / <sub>8</sub>	16'' o.c.	8d	6'' o.c. edges; 12'' o.c. at intermediate supports	4'' o.c. edges; 8'' o.c. at intermediate supports

For SI: 1 inch = 25.4 mm.

a. Nails shall be corrosion resistant.

b. Minimum acceptable nail dimensions:

c. Where used to comply with Section 2308.9.3.

d. Nail length must accommodate the sheathing and penetrate framing  $1\frac{1}{2}$  inches.

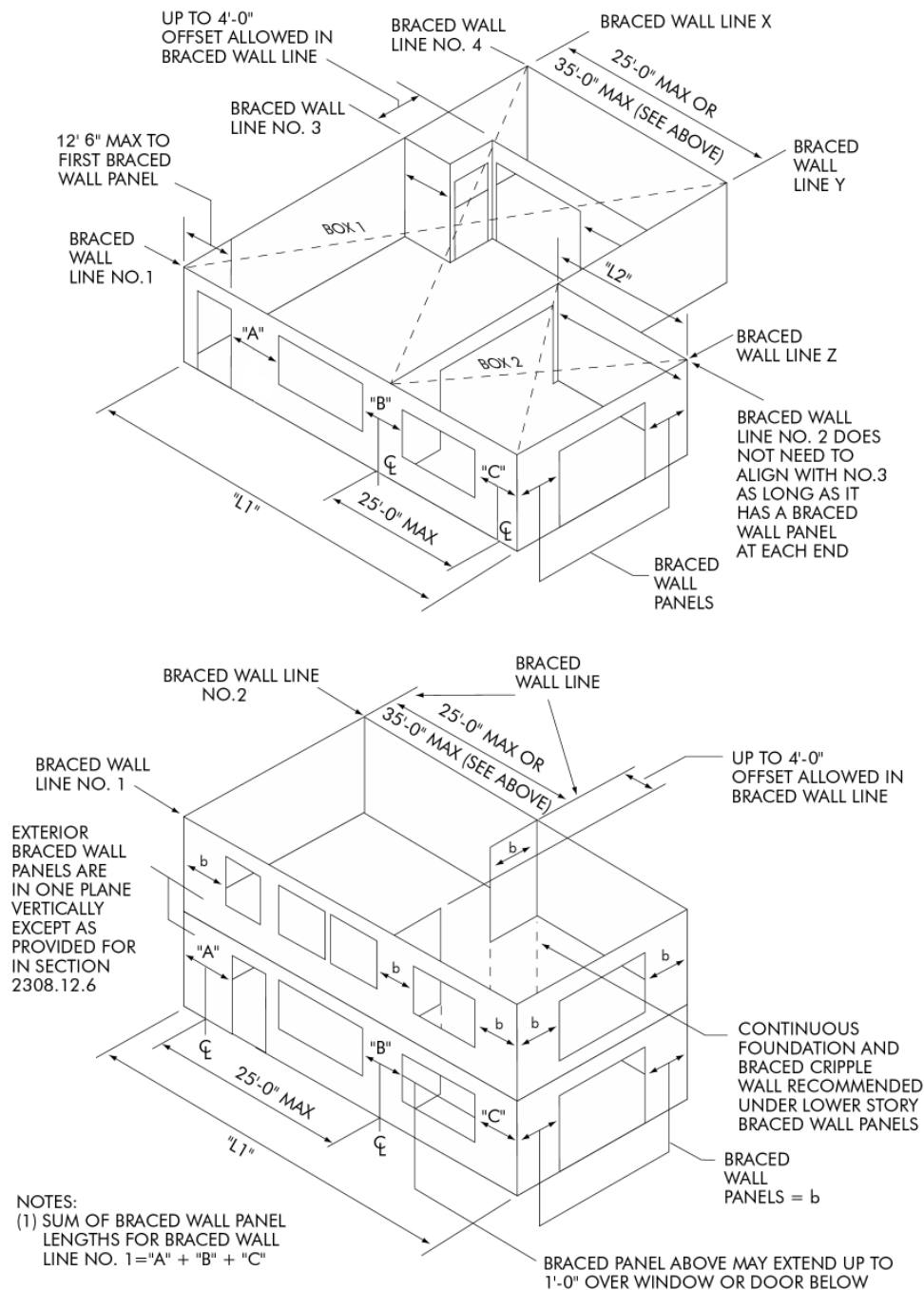
	Panel Siding (inch)	Lap Siding (inch)
Shank diameter	0.092	0.099
Head diameter	0.225	0.240

For cripple wall bracing, see Section 2308.9.4.1. For Methods 2, 3, 4, 6, 7 and 8, each panel must be at least 48 inches (1219 mm) in length, covering three stud spaces where studs are spaced 16 inches (406 mm) apart and covering two stud spaces where studs are spaced 24 inches (610 mm) apart. For Method 5, each panel must be at least 96 inches (2438 mm) in length where applied to one face of a panel and 48 inches (1219 mm) where applied to both faces. All vertical joints of panel sheathing shall occur over studs and adjacent panel joints shall be nailed to

common framing members. Horizontal joints shall occur over blocking or other framing equal in size to the stud- ding except where waived by the installation require- ments for the specific sheathing materials. Sole plates shall be nailed to the floor framing and top plates shall be connected to the framing above in accordance with Sec- tion 2308.3.2. Where joists are perpendicular to braced wall lines above, blocking shall be provided under and in line with the braced wall panels.



SEISMIC DESIGN CATEGORY	MAXIMUM WALL SPACING (feet)	REQUIRED BRACING LENGTH, $b$
A, B and C	35'-0"	Table 2308.9.3(1) and Section 2308.9.3
D and E	25'-0"	Table 2308.12.4



For SI: 1 inch = 25.4 mm. 1 foot = 304.8 mm.

**FIGURE 2308.9.3  
BASIC COMPONENTS OF THE LATERAL BRACING SYSTEM**

**2308.9.3.1 Alternative bracing.** Any bracing required by Section 2308.9.3 is permitted to be replaced by the following:

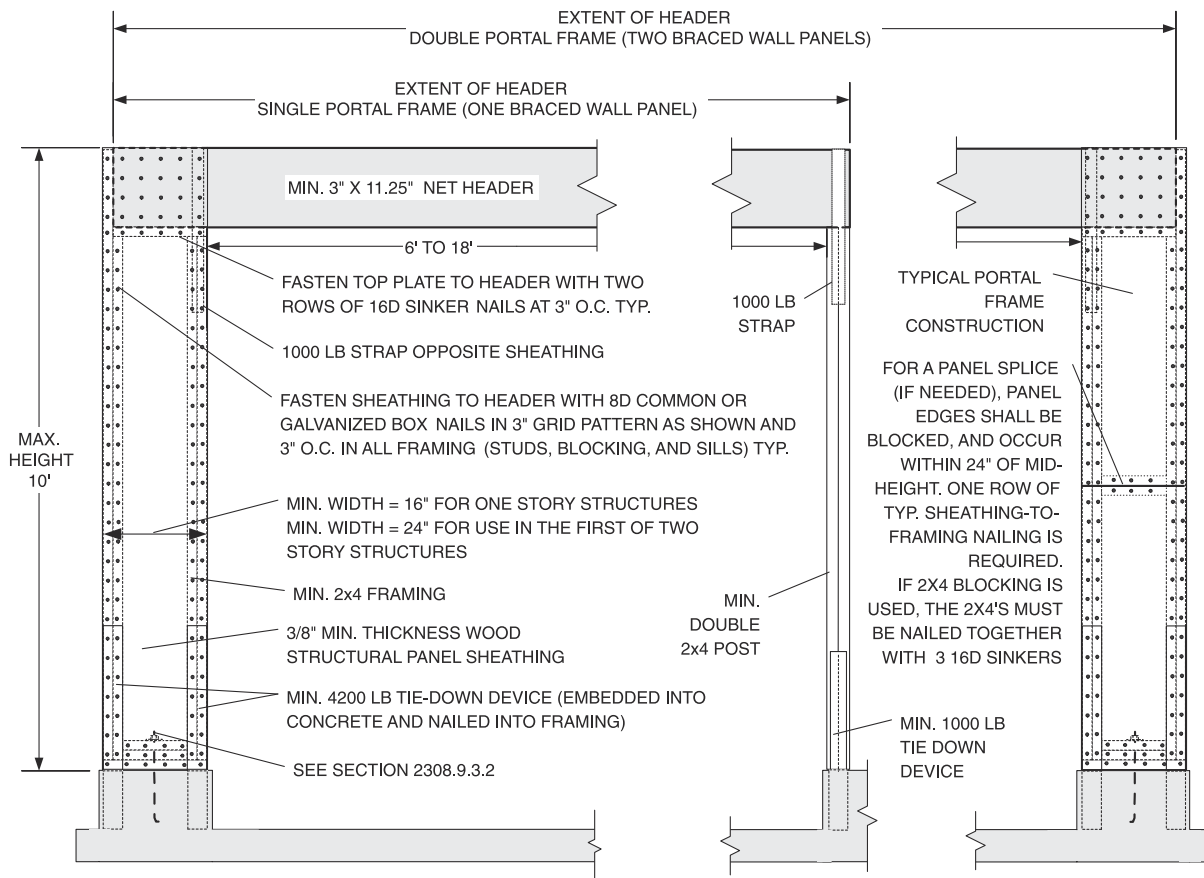
1. In one-story buildings, each panel shall have a length of not less than 2 feet 8 inches (813 mm) and a height of not more than 10 feet (3048 mm). Each panel shall be sheathed on one face with  $\frac{3}{8}$ -inch-minimum-thickness (9.5 mm) wood structural panel sheathing nailed with 8d common or galvanized box nails in accordance with Table 2304.9.1 and blocked at wood structural panel edges. Two anchor bolts installed in accordance with Section 2308.6 shall be provided in each panel. Anchor bolts shall be placed at each panel outside quarter points. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an approved uplift capacity of not less than 1,800 pounds (8006 N). The tie-down device shall be installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation that is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom. Where the continuous foundation is required to have a depth greater than 12 inches (305 mm), a minimum 12-inch by 12-inch (305 mm by 305 mm) continuous footing or turned down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.
2. In the first story of two-story buildings, each wall panel shall be braced in accordance with Section 2308.9.3.1, Item 1, except that the wood structural panel sheathing shall be provided on both faces, three anchor bolts shall be placed at one-quarter points, and tie-down device uplift capacity shall not be less than 3,000 pounds (13 344 N).

**2308.9.3.2 Alternate bracing wall panel adjacent to a door or window opening.** Any bracing required by Section 2308.9.3 is permitted to be replaced by the following when used adjacent to a door or window opening with a full-length header:

1. In one-story buildings, each panel shall have a length of not less than 16 inches (406 mm) and a height of not more than 10 feet (3048 mm). Each panel shall be sheathed on one face with a single layer of  $\frac{3}{8}$  inch (9.5 mm) minimum thickness wood structural panel sheathing

nailed with 8d common or galvanized box nails in accordance with Figure 2308.9.3.2. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed in accordance with Figure 2308.9.3.2. A built-up header consisting of at least two  $2 \times 12$ s and fastened in accordance with Item 24 of Table 2304.9.1 shall be permitted to be used. A spacer, if used, shall be placed on the side of the built-up beam opposite the wood structural panel sheathing. The header shall extend between the inside faces of the first full-length outer studs of each panel. The clear span of the header between the inner studs of each panel shall be not less than 6 feet (1829 mm) and not more than 18 feet (5486 mm) in length. A strap with an uplift capacity of not less than 1,000 pounds (4,400 N) shall fasten the header to the inner studs opposite the sheathing. One anchor bolt not less than  $\frac{5}{8}$  inch (15.9 mm) diameter and installed in accordance with Section 2308.6 shall be provided in the center of each sill plate. The studs at each end of the panel shall have a tie-down device fastened to the foundation with an uplift capacity of not less than 4,200 pounds (18 480 N). Where a panel is located on one side of the opening, the header shall extend between the inside face of the first full-length stud of the panel and the bearing studs at the other end of the opening. A strap with an uplift capacity of not less than 1,000 pounds (4400 N) shall fasten the header to the bearing studs. The bearing studs shall also have a tie-down device fastened to the foundation with an uplift capacity of not less than 1,000 pounds (4400 N). The tie-down devices shall be an embedded strap type, installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation that is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom. Where the continuous foundation is required to have a depth greater than 12 inches (305 mm), a minimum 12-inch by 12-inch (305 mm by 305 mm) continuous footing or turned down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped not less than 15 inches (381 mm) with the reinforcement required in the continuous foundation located directly under the braced wall line.

2. In the first story of two-story buildings, each wall panel shall be braced in accordance with Item 1 above, except that each panel shall have a length of not less than 24 inches (610 mm).



For SI: 1 foot = 304.8 mm; 1 inch = 25.4 mm; 1 pound = 4.448 N.

**FIGURE 2308.9.3.2**  
**ALTERNATE BRACED WALL PANEL ADJACENT TO A DOOR OR WINDOW OPENING**

**2308.9.4 Cripple walls.** Foundation cripple walls shall be framed of studs not less in size than the studding above with a minimum length of 14 inches (356 mm), or shall be framed of solid blocking. Where exceeding 4 feet (1219 mm) in height, such walls shall be framed of studs having the size required for an additional story.

**2308.9.4.1 Bracing.** For the purposes of this section, cripple walls having a stud height exceeding 14 inches (356 mm) shall be considered a story and shall be braced in accordance with Table 2308.9.3(1) for Seismic Design Category A, B or C. See Section 2308.12.4 for Seismic Design Category D.

**2308.9.4.2 Nailing of bracing.** Spacing of edge nailing for required wall bracing shall not exceed 6 inches (152 mm) o.c. along the foundation plate and the top plate of the cripple wall. Nail size, nail spacing for field nailing and more restrictive boundary nailing

requirements shall be as required elsewhere in the code for the specific bracing material used.

#### **2308.9.5 Openings in exterior walls.**

**2308.9.5.1 Headers.** Headers shall be provided over each opening in exterior-bearing walls. The spans in Table 2308.9.5 are permitted to be used for one- and two-family dwellings. Headers for other buildings shall be designed in accordance with Section 2301.2, Item 1 or 2. Headers shall be of two pieces of nominal 2-inch (51 mm) framing lumber set on edge as permitted by Table 2308.9.5 and nailed together in accordance with Table 2304.9.1 or of solid lumber of equivalent size.

**2308.9.5.2 Header support.** Wall studs shall support the ends of the header in accordance with Table 2308.9.5. Each end of a lintel or header shall have a length of bearing of not less than  $1\frac{1}{2}$  inches (38 mm) for the full width of the lintel.

**TABLE 2308.9.5**  
**HEADER AND GIRDER SPANS<sup>a</sup> FOR EXTERIOR BEARING WALLS**  
 (Maximum Spans for Douglas Fir-Larch, Hem-Fir, Southern Pine and Spruce-Pine-Fir<sup>b</sup> and Required Number of Jack Studs)

HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) <sup>c</sup>											
		30						50					
		Building width <sup>c</sup> (feet)											
		20		28		36		20		28		36	
		Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>
Roof & Ceiling	2-2×4	3-6	1	3-2	1	2-10	1	3-2	1	2-9	1	2-6	1
	2-2×6	5-5	1	4-8	1	4-2	1	4-8	1	4-1	1	3-8	2
	2-2×8	6-10	1	5-11	2	5-4	2	5-11	2	5-2	2	4-7	2
	2-2×10	8-5	2	7-3	2	6-6	2	7-3	2	6-3	2	5-7	2
	2-2×12	9-9	2	8-5	2	7-6	2	8-5	2	7-3	2	6-6	2
	3-2×8	8-4	1	7-5	1	6-8	1	7-5	1	6-5	2	5-9	2
	3-2×10	10-6	1	9-1	2	8-2	2	9-1	2	7-10	2	7-0	2
	3-2×12	12-2	2	10-7	2	9-5	2	10-7	2	9-2	2	8-2	2
	4-2×8	9-2	1	8-4	1	7-8	1	8-4	1	7-5	1	6-8	1
	4-2×10	11-8	1	10-6	1	9-5	2	10-6	1	9-1	2	8-2	2
	4-2×12	14-1	1	12-2	2	10-11	2	12-2	2	10-7	2	9-5	2
Roof, Ceiling & 1 Center-Bearing Floor	2-2×4	3-1	1	2-9	1	2-5	1	2-9	1	2-5	1	2-2	1
	2-2×6	4-6	1	4-0	1	3-7	2	4-1	1	3-7	2	3-3	2
	2-2×8	5-9	2	5-0	2	4-6	2	5-2	2	4-6	2	4-1	2
	2-2×10	7-0	2	6-2	2	5-6	2	6-4	2	5-6	2	5-0	2
	2-2×12	8-1	2	7-1	2	6-5	2	7-4	2	6-5	2	5-9	3
	3-2×8	7-2	1	6-3	2	5-8	2	6-5	2	5-8	2	5-1	2
	3-2×10	8-9	2	7-8	2	6-11	2	7-11	2	6-11	2	6-3	2
	3-2×12	10-2	2	8-11	2	8-0	2	9-2	2	8-0	2	7-3	2
	4-2×8	8-1	1	7-3	1	6-7	1	7-5	1	6-6	1	5-11	2
	4-2×10	10-1	1	8-10	2	8-0	2	9-1	2	8-0	2	7-2	2
	4-2×12	11-9	2	10-3	2	9-3	2	10-7	2	9-3	2	8-4	2
Roof, Ceiling & 1 Clear Span Floor	2-2×4	2-8	1	2-4	1	2-1	1	2-7	1	2-3	1	2-0	1
	2-2×6	3-11	1	3-5	2	3-0	2	3-10	2	3-4	2	3-0	2
	2-2×8	5-0	2	4-4	2	3-10	2	4-10	2	4-2	2	3-9	2
	2-2×10	6-1	2	5-3	2	4-8	2	5-11	2	5-1	2	4-7	3
	2-2×12	7-1	2	6-1	3	5-5	3	6-10	2	5-11	3	5-4	3
	3-2×8	6-3	2	5-5	2	4-10	2	6-1	2	5-3	2	4-8	2
	3-2×10	7-7	2	6-7	2	5-11	2	7-5	2	6-5	2	5-9	2
	3-2×12	8-10	2	7-8	2	6-10	2	8-7	2	7-5	2	6-8	2
	4-2×8	7-2	1	6-3	2	5-7	2	7-0	1	6-1	2	5-5	2
	4-2×10	8-9	2	7-7	2	6-10	2	8-7	2	7-5	2	6-7	2
	4-2×12	10-2	2	8-10	2	7-11	2	9-11	2	8-7	2	7-8	2

(continued)



**TABLE 2308.9.5—continued**  
**HEADER AND GIRDER SPANS<sup>a</sup> FOR EXTERIOR BEARING WALLS**  
**(Maximum Spans for Douglas Fir-Larch, Hem-Fir, Southern Pine and Spruce-Pine-Fir<sup>b</sup> and Required Number of Jack Studs)**

HEADERS SUPPORTING	SIZE	GROUND SNOW LOAD (psf) <sup>c</sup>											
		30						50					
		Building width <sup>c</sup> (feet)											
		20		28		36		20		28		36	
		Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>
Roof, Ceiling & 2 Center-Bearing Floors	2-2×4	2-7	1	2-3	1	2-0	1	2-6	1	2-2	1	1-11	1
	2-2×6	3-9	2	3-3	2	2-11	2	3-8	2	3-2	2	2-10	2
	2-2×8	4-9	2	4-2	2	3-9	2	4-7	2	4-0	2	3-8	2
	2-2×10	5-9	2	5-1	2	4-7	3	5-8	2	4-11	2	4-5	3
	2-2×12	6-8	2	5-10	3	5-3	3	6-6	2	5-9	3	5-2	3
	3-2×8	5-11	2	5-2	2	4-8	2	5-9	2	5-1	2	4-7	2
	3-2×10	7-3	2	6-4	2	5-8	2	7-1	2	6-2	2	5-7	2
	3-2×12	8-5	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	3
	4-2×8	6-10	1	6-0	2	5-5	2	6-8	1	5-10	2	5-3	2
	4-2×10	8-4	2	7-4	2	6-7	2	8-2	2	7-2	2	6-5	2
	4-2×12	9-8	2	8-6	2	7-8	2	9-5	2	8-3	2	7-5	2
Roof, Ceiling & 2 Clear Span Floors	2-2×4	2-1	1	1-8	1	1-6	2	2-0	1	1-8	1	1-5	2
	2-2×6	3-1	2	2-8	2	2-4	2	3-0	2	2-7	2	2-3	2
	2-2×8	3-10	2	3-4	2	3-0	3	3-10	2	3-4	2	2-11	3
	2-2×10	4-9	2	4-1	3	3-8	3	4-8	2	4-0	3	3-7	3
	2-2×12	5-6	3	4-9	3	4-3	3	5-5	3	4-8	3	4-2	3
	3-2×8	4-10	2	4-2	2	3-9	2	4-9	2	4-1	2	3-8	2
	3-2×10	5-11	2	5-1	2	4-7	3	5-10	2	5-0	2	4-6	3
	3-2×12	6-10	2	5-11	3	5-4	3	6-9	2	5-10	3	5-3	3
	4-2×8	5-7	2	4-10	2	4-4	2	5-6	2	4-9	2	4-3	2
	4-2×10	6-10	2	5-11	2	5-3	2	6-9	2	5-10	2	5-2	2
	4-2×12	7-11	2	6-10	2	6-2	3	7-9	2	6-9	2	6-0	3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m<sup>2</sup>.

- Spans are given in feet and inches (ft-in).
- Tabulated values are for No. 2 grade lumber.
- Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.
- NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.
- Use 30 pounds per square foot ground snow load for cases in which ground snow load is less than 30 pounds per square foot and the roof live load is equal to or less than 20 pounds per square foot.

**TABLE 2308.9.6**  
**HEADER AND GIRDER SPANS<sup>a</sup> FOR INTERIOR BEARING WALLS**  
**(Maximum Spans for Douglas Fir-Larch, Hem-Fir, Southern Pine and Spruce-Pine-Fir<sup>b</sup> and Required Number of Jack Studs)**

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING width <sup>c</sup> (feet)					
		20		28		36	
		Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>	Span	NJ <sup>d</sup>
One Floor Only	2-2×4	3-1	1	2-8	1	2-5	1
	2-2×6	4-6	1	3-11	1	3-6	1
	2-2×8	5-9	1	5-0	2	4-5	2
	2-2×10	7-0	2	6-1	2	5-5	2
	2-2×12	8-1	2	7-0	2	6-3	2
	3-2×8	7-2	1	6-3	1	5-7	2
	3-2×10	8-9	1	7-7	2	6-9	2
	3-2×12	10-2	2	8-10	2	7-10	2
	4-2×8	9-0	1	7-8	1	6-9	1
	4-2×10	10-1	1	8-9	1	7-10	2
	4-2×12	11-9	1	10-2	2	9-1	2
Two Floors	2-2×4	2-2	1	1-10	1	1-7	1
	2-2×6	3-2	2	2-9	2	2-5	2
	2-2×8	4-1	2	3-6	2	3-2	2
	2-2×10	4-11	2	4-3	2	3-10	3
	2-2×12	5-9	2	5-0	3	4-5	3
	3-2×8	5-1	2	4-5	2	3-11	2
	3-2×10	6-2	2	5-4	2	4-10	2
	3-2×12	7-2	2	6-3	2	5-7	3
	4-2×8	6-1	1	5-3	2	4-8	2
	4-2×10	7-2	2	6-2	2	5-6	2
	4-2×12	8-4	2	7-2	2	6-5	2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Spans are given in feet and inches (ft-in).

b. Tabulated values are for No. 2 grade lumber.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ - Number of jack studs required to support each end. Where the number of required jack studs equals one, the headers are permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

**2308.9.6 Openings in interior bearing partitions.** Headers shall be provided over each opening in interior bearing partitions as required in Section 2308.9.5. The spans in Table 2308.9.6 are permitted to be used. Wall studs shall support the ends of the header in accordance with Table 2308.9.5 or 2308.9.6, as appropriate.

**2308.9.7 Openings in interior nonbearing partitions.** Openings in nonbearing partitions are permitted to be framed with single studs and headers. Each end of a lintel or header shall have a length of bearing of not less than 1½ inches (38 mm) for the full width of the lintel.

**2308.9.8 Pipes in walls.** Stud partitions containing plumbing, heating or other pipes shall be so framed and the joists underneath so spaced as to give proper clearance for the piping. Where a partition containing such piping runs parallel to the floor joists, the joists underneath such partitions shall be doubled and spaced to permit the passage of such pipes and shall be bridged.

Where plumbing, heating or other pipes are placed in or partly in a partition, necessitating the cutting of the soles or plates, a metal tie not less than 0.058 inch (1.47 mm) (16 galvanized gage) and 1½ inches (38 mm) wide shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.

**2308.9.9 Bridging.** Unless covered by interior or exterior wall coverings or sheathing meeting the minimum requirements of this code, stud partitions or walls with studs having a height-to-least-thickness ratio exceeding 50 shall have bridging not less than 2 inches (51 mm) in thickness and of the same width as the studs fitted snugly and nailed thereto to provide adequate lateral support. Bridging shall be placed in every stud cavity and at a frequency such that no stud so braced shall have a height-to-least-thickness ratio exceeding 50 with the height of the stud measured between horizontal framing and bridging or between bridging, whichever is greater.

**2308.9.10 Cutting and notching.** In exterior walls and bearing partitions, any wood stud is permitted to be cut or notched to a depth not exceeding 25 percent of its width. Cutting or notching of studs to a depth not greater than 40 percent of the width of the stud is permitted in nonbearing partitions supporting no loads other than the weight of the partition.

**2308.9.11 Bored holes.** A hole not greater in diameter than 40 percent of the stud width is permitted to be bored in any wood stud. Bored holes not greater than 60 percent of the width of the stud are permitted in nonbearing partitions or in any wall where each bored stud is doubled, provided not more than two such successive doubled studs are so bored. In no case shall the edge of the bored hole be nearer than  $\frac{5}{8}$  inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

**2308.10 Roof and ceiling framing.** The framing details required in this section apply to roofs having a minimum

slope of three units vertical in 12 units horizontal (25-percent slope) or greater. Where the roof slope is less than three units vertical in 12 units horizontal (25-percent slope), members supporting rafters and ceiling joists such as ridge board, hips and valleys shall be designed as beams.

**2308.10.1 Wind uplift.** The roof construction shall have rafter and truss ties to the wall below. Resultant uplift loads shall be transferred to the foundation using a continuous load path. The rafter or truss to wall connection shall comply with Tables 2304.9.1 and 2308.10.1.

**2308.10.2 Ceiling joist spans.** Allowable spans for ceiling joists shall be in accordance with Table 2308.10.2(1) or 2308.10.2(2). For other grades and species, refer to the AF&PA Span Tables for Joists and Rafters.

**2308.10.3 Rafter spans.** Allowable spans for rafters shall be in accordance with Table 2308.10.3(1), 2308.10.3(2), 2308.10.3(3), 2308.10.3(4), 2308.10.3(5) or 2308.10.3(6). For other grades and species, refer to the AF&PA Span Tables for Joists and Rafters.

**TABLE 2308.10.1**  
**REQUIRED RATING OF APPROVED UPLIFT CONNECTORS (pounds)<sup>a, b, c, e, f, g, h</sup>**

BASIC WIND SPEED (3-second gust)	ROOF SPAN (feet)							OVERHANGS (pounds/foot) <sup>d</sup>
	12	20	24	28	32	36	40	
85	-72	-120	-145	-169	-193	-217	-241	-38.55
90	-91	-151	-181	-212	-242	-272	-302	-43.22
100	-131	-281	-262	-305	-349	-393	-436	-53.36
110	-175	-292	-351	-409	-467	-526	-584	-64.56

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 1.61 km/hr, 1 pound = 0.454 Kg, 1 pound/foot = 14.5939 N/m.

a. The uplift connection requirements are based on a 30-foot mean roof height located in Exposure B. For Exposure C or D and for other mean roof heights, multiply the above loads by the adjustment coefficients below.

EXPOSURE	Mean Roof Height (feet)									
	15	20	25	30	35	40	45	50	55	60
B	1.00	1.00	1.00	1.00	1.05	1.09	1.12	1.16	1.19	1.22
C	1.21	1.29	1.35	1.40	1.45	1.49	1.53	1.56	1.59	1.62
D	1.47	1.55	1.61	1.66	1.70	1.74	1.78	1.81	1.84	1.87

b. The uplift connection requirements are based on the framing being spaced 24 inches on center. Multiply by 0.67 for framing spaced 16 inches on center and multiply by 0.5 for framing spaced 12 inches on center.

c. The uplift connection requirements include an allowance for 10 pounds of dead load.

d. The uplift connection requirements do not account for the effects of overhangs. The magnitude of the above loads shall be increased by adding the overhang loads found in the table. The overhang loads are also based on framing spaced 24 inches on center. The overhang loads given shall be multiplied by the overhang projection and added to the roof uplift value in the table.

e. The uplift connection requirements are based upon wind loading on end zones as defined in Figure 28.6.3 of ASCE 7. Connection loads for connections located a distance of 20 percent of the least horizontal dimension of the building from the corner of the building are permitted to be reduced by multiplying the table connection value by 0.7 and multiplying the overhang load by 0.8.

f. For wall-to-wall and wall-to-foundation connections, the capacity of the uplift connector is permitted to be reduced by 100 pounds for each full wall above. (For example, if a 500-pound rated connector is used on the roof framing, a 400-pound rated connector is permitted at the next floor level down).

g. Interpolation is permitted for intermediate values of  $V_{wd}$  and roof spans.

h. The rated capacity of approved tie-down devices is permitted to include up to a 60-percent increase for wind effects where allowed by material specifications.

**TABLE 2308.10.2(1)**  
**CEILING JOIST SPANS FOR COMMON LUMBER SPECIES**  
(Uninhabitable Attics Without Storage, Live Load = 10 pounds psf,  $L/\Delta = 240$ )

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 pounds per square foot			
			2x4	2x6	2x8	2x10
			Maximum ceiling joist spans			
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	13-2	20-8	26-0	26-0
	Douglas Fir-Larch	#1	12-8	19-11	26-0	26-0
	Douglas Fir-Larch	#2	12-5	19-6	25-8	26-0
	Douglas Fir-Larch	#3	10-10	15-10	20-1	24-6
	Hem-Fir	SS	12-5	19-6	25-8	26-0
	Hem-Fir	#1	12-2	19-1	25-2	26-0
	Hem-Fir	#2	11-7	18-2	24-0	26-0
	Hem-Fir	#3	10-10	15-10	20-1	24-6
	Southern Pine	SS	12-11	20-3	26-0	26-0
	Southern Pine	#1	12-8	19-11	26-0	26-0
	Southern Pine	#2	12-5	19-6	25-8	26-0
	Southern Pine	#3	11-6	17-0	21-8	25-7
	Spruce-Pine-Fir	SS	12-2	19-1	25-2	26-0
	Spruce-Pine-Fir	#1	11-10	18-8	24-7	26-0
	Spruce-Pine-Fir	#2	11-10	18-8	24-7	26-0
	Spruce-Pine-Fir	#3	10-10	15-10	20-1	24-6
16	Douglas Fir-Larch	SS	11-11	18-9	24-8	26-0
	Douglas Fir-Larch	#1	11-6	18-1	23-10	26-0
	Douglas Fir-Larch	#2	11-3	17-8	23-0	26-0
	Douglas Fir-Larch	#3	9-5	13-9	17-5	21-3
	Hem-Fir	SS	11-3	17-8	23-4	26-0
	Hem-Fir	#1	11-0	17-4	22-10	26-0
	Hem-Fir	#2	10-6	16-6	21-9	26-0
	Hem-Fir	#3	9-5	13-9	17-5	21-3
	Southern Pine	SS	11-9	18-5	24-3	26-0
	Southern Pine	#1	11-6	18-1	23-1	26-0
	Southern Pine	#2	11-3	17-8	23-4	26-0
	Southern Pine	#3	10-0	14-9	18-9	22-2
	Spruce-Pine-Fir	SS	11-0	17-4	22-10	26-0
	Spruce-Pine-Fir	#1	10-9	16-11	22-4	26-0
	Spruce-Pine-Fir	#2	10-9	16-11	22-4	26-0
	Spruce-Pine-Fir	#3	9-5	13-9	17-5	21-3

(continued)



**TABLE 2308.10.2(1)—continued**  
**CEILING JOIST SPANS FOR COMMON LUMBER SPECIES**  
(Uninhabitable Attics Without Storage, Live Load = 10 pounds psf,  $L/\Delta = 240$ )

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 5 pounds per square foot			
			2x4	2x6	2x8	2x10
			Maximum ceiling joist spans			
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	11-3	17-8	23-3	26-0
	Douglas Fir-Larch	#1	10-10	17-0	22-5	26-0
	Douglas Fir-Larch	#2	10-7	16-7	21-0	25-8
	Douglas Fir-Larch	#3	8-7	12-6	15-10	19-5
	Hem-Fir	SS	10-7	16-8	21-11	26-0
	Hem-Fir	#1	10-4	16-4	21-6	26-0
	Hem-Fir	#2	9-11	15-7	20-6	25-3
	Hem-Fir	#3	8-7	12-6	15-10	19-5
	Southern Pine	SS	11-0	17-4	22-10	26-0
	Southern Pine	#1	10-10	17-0	22-5	26-0
	Southern Pine	#2	10-7	16-8	21-11	26-0
	Southern Pine	#3	9-1	13-6	17-2	20-3
	Spruce-Pine-Fir	SS	10-4	16-4	21-6	26-0
	Spruce-Pine-Fir	#1	10-2	15-11	21-0	25-8
	Spruce-Pine-Fir	#2	10-2	15-11	21-0	25-8
	Spruce-Pine-Fir	#3	8-7	12-6	15-10	19-5
24	Douglas Fir-Larch	SS	10-5	16-4	21-7	26-0
	Douglas Fir-Larch	#1	10-0	15-9	20-1	24-6
	Douglas Fir-Larch	#2	9-10	14-10	18-9	22-11
	Douglas Fir-Larch	#3	7-8	11-2	14-2	17-4
	Hem-Fir	SS	9-10	15-6	20-5	26-0
	Hem-Fir	#1	9-8	15-2	19-7	23-11
	Hem-Fir	#2	9-2	14-5	18-6	22-7
	Hem-Fir	#3	7-8	11-2	14-2	17-4
	Southern Pine	SS	10-3	16-1	21-2	26-0
	Southern Pine	#1	10-0	15-9	20-10	26-0
	Southern Pine	#2	9-10	15-6	20-1	23-11
	Southern Pine	#3	8-2	12-0	15-4	18-1
	Spruce-Pine-Fir	SS	9-8	15-2	19-11	25-5
	Spruce-Pine-Fir	#1	9-5	14-9	18-9	22-11
	Spruce-Pine-Fir	#2	9-5	14-9	18-9	22-11
	Spruce-Pine-Fir	#3	7-8	11-2	14-2	17-4

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m<sup>2</sup>.

**TABLE 2308.10.2(2)**  
**CEILING JOIST SPANS FOR COMMON LUMBER SPECIES**  
(Uninhabitable Attics With Limited Storage, Live Load = 20 pounds per square foot,  $L/\Delta = 240$ )

CEILING JOIST SPACING (inches)	SPECIES AND GRADE	DEAD LOAD = 10 pounds per square foot			
		2x4	2x6	2x8	2x10
		Maximum ceiling joist spans			
		(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch SS	10-5	16-4	21-7	26-0
	Douglas Fir-Larch #1	10-0	15-9	20-1	24-6
	Douglas Fir-Larch #2	9-10	14-10	18-9	22-11
	Douglas Fir-Larch #3	7-8	11-2	14-2	17-4
	Hem-Fir SS	9-10	15-6	20-5	26-0
	Hem-Fir #1	9-8	15-2	19-7	23-11
	Hem-Fir #2	9-2	14-5	18-6	22-7
	Hem-Fir #3	7-8	11-2	14-2	17-4
	Southern Pine SS	10-3	16-1	21-2	26-0
	Southern Pine #1	10-0	15-9	20-10	26-0
	Southern Pine #2	9-10	15-6	20-1	23-11
	Southern Pine #3	8-2	12-0	15-4	18-1
	Spruce-Pine-Fir SS	9-8	15-2	19-11	25-5
	Spruce-Pine-Fir #1	9-5	14-9	18-9	22-11
	Spruce-Pine-Fir #2	9-5	14-9	18-9	22-11
	Spruce-Pine-Fir #3	7-8	11-2	14-2	17-4
16	Douglas Fir-Larch SS	9-6	14-11	19-7	25-0
	Douglas Fir-Larch #1	9-1	13-9	17-5	21-3
	Douglas Fir-Larch #2	8-9	12-10	16-3	19-10
	Douglas Fir-Larch #3	6-8	9-8	12-4	15-0
	Hem-Fir SS	8-11	14-1	18-6	23-8
	Hem-Fir #1	8-9	13-5	16-10	20-8
	Hem-Fir #2	8-4	12-8	16-0	19-7
	Hem-Fir #3	6-8	9-8	12-4	15-0
	Southern Pine SS	9-4	14-7	19-3	24-7
	Southern Pine #1	9-1	14-4	18-11	23-1
	Southern Pine #2	8-11	13-6	17-5	20-9
	Southern Pine #3	7-1	10-5	13-3	15-8
	Spruce-Pine-Fir SS	8-9	13-9	18-1	23-1
	Spruce-Pine-Fir #1	8-7	12-10	16-3	19-10
	Spruce-Pine-Fir #2	8-7	12-10	16-3	19-10
	Spruce-Pine-Fir #3	6-8	9-8	12-4	15-0

(continued)

**TABLE 2308.10.2(2)—continued**  
**CEILING JOIST SPANS FOR COMMON LUMBER SPECIES**  
 (Uninhabitable Attics With Limited Storage, Live Load = 20 pounds per square foot,  $L/\Delta = 240$ )

CEILING JOIST SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot			
			2×4	2×6	2×8	2×10
			Maximum ceiling joist spans			
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	8-11	14-0	18-5	23-4
	Douglas Fir-Larch	#1	8-7	12-6	15-10	19-5
	Douglas Fir-Larch	#2	8-0	11-9	14-10	18-2
	Douglas Fir-Larch	#3	6-1	8-10	11-3	13-8
	Hem-Fir	SS	8-5	13-3	17-5	22-3
	Hem-Fir	#1	8-3	12-3	15-6	18-11
	Hem-Fir	#2	7-10	11-7	14-8	17-10
	Hem-Fir	#3	6-1	8-10	11-3	13-8
	Southern Pine	SS	8-9	13-9	18-1	23-1
	Southern Pine	#1	8-7	13-6	17-9	21-1
	Southern Pine	#2	8-5	12-3	15-10	18-11
	Southern Pine	#3	6-5	9-6	12-1	14-4
	Spruce-Pine-Fir	SS	8-3	12-11	17-1	21-8
	Spruce-Pine-Fir	#1	8-0	11-9	14-10	18-2
	Spruce-Pine-Fir	#2	8-0	11-9	14-10	18-2
	Spruce-Pine-Fir	#3	6-1	8-10	11-3	13-8
24	Douglas Fir-Larch	SS	8-3	13-0	17-1	20-11
	Douglas Fir-Larch	#1	7-8	11-2	14-2	17-4
	Douglas Fir-Larch	#2	7-2	10-6	13-3	16-3
	Douglas Fir-Larch	#3	5-5	7-11	10-0	12-3
	Hem-Fir	SS	7-10	12-3	16-2	20-6
	Hem-Fir	#1	7-6	10-11	13-10	16-11
	Hem-Fir	#2	7-1	10-4	13-1	16-0
	Hem-Fir	#3	5-5	7-11	10-0	12-3
	Southern Pine	SS	8-1	12-9	16-10	21-6
	Southern Pine	#1	8-0	12-6	15-10	18-10
	Southern Pine	#2	7-8	11-0	14-2	16-11
	Southern Pine	#3	5-9	8-6	10-10	12-10
	Spruce-Pine-Fir	SS	7-8	12-0	15-10	19-5
	Spruce-Pine-Fir	#1	7-2	10-6	13-3	16-3
	Spruce-Pine-Fir	#2	7-2	10-6	13-3	16-3
	Spruce-Pine-Fir	#3	5-5	7-11	10-0	12-3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m<sup>2</sup>.

**TABLE 2308.10.3(1)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
(Roof Live Load = 20 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	11-6	18-0	23-9	26-0	26-0	11-6	18-0	23-5	26-0	26-0
	Douglas Fir-Larch	#1	11-1	17-4	22-5	26-0	26-0	10-6	15-4	19-5	23-9	26-0
	Douglas Fir-Larch	#2	10-10	16-7	21-0	25-8	26-0	9-10	14-4	18-2	22-3	25-9
	Douglas Fir-Larch	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Hem-Fir	SS	10-10	17-0	22-5	26-0	26-0	10-10	17-0	22-5	26-0	26-0
	Hem-Fir	#1	10-7	16-8	21-10	26-0	26-0	10-3	14-11	18-11	23-2	26-0
	Hem-Fir	#2	10-1	15-11	20-8	25-3	26-0	9-8	14-2	17-11	21-11	25-5
	Hem-Fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern Pine	SS	11-3	17-8	23-4	26-0	26-0	11-3	17-8	23-4	26-0	26-0
	Southern Pine	#1	11-1	17-4	22-11	26-0	26-0	11-1	17-3	21-9	25-10	26-0
	Southern Pine	#2	10-10	17-0	22-5	26-0	26-0	10-6	15-1	19-5	23-2	26-0
	Southern Pine	#3	9-1	13-6	17-2	20-3	24-1	7-11	11-8	14-10	17-6	20-11
	Spruce-Pine-Fir	SS	10-7	16-8	21-11	26-0	26-0	10-7	16-8	21-9	26-0	26-0
	Spruce-Pine-Fir	#1	10-4	16-3	21-0	25-8	26-0	9-10	14-4	18-2	22-3	25-9
	Spruce-Pine-Fir	#2	10-4	16-3	21-0	25-8	26-0	9-10	14-4	18-2	22-3	25-9
	Spruce-Pine-Fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
16	Douglas Fir-Larch	SS	10-5	16-4	21-7	26-0	26-0	10-5	16-0	20-3	24-9	26-0
	Douglas Fir-Larch	#1	10-0	15-4	19-5	23-9	26-0	9-1	13-3	16-10	20-7	23-10
	Douglas Fir-Larch	#2	9-10	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Douglas Fir-Larch	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Hem-Fir	SS	9-10	15-6	20-5	26-0	26-0	9-10	15-6	19-11	24-4	26-0
	Hem-Fir	#1	9-8	14-11	18-11	23-2	26-0	8-10	12-11	16-5	20-0	23-3
	Hem-Fir	#2	9-2	14-2	17-11	21-11	25-5	8-5	12-3	15-6	18-11	22-0
	Hem-Fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern Pine	SS	10-3	16-1	21-2	26-0	26-0	10-3	16-1	21-2	26-0	26-0
	Southern Pine	#1	10-0	15-9	20-10	25-10	26-0	10-0	15-0	18-10	22-4	26-0
	Southern Pine	#2	9-10	15-1	19-5	23-2	26-0	9-1	13-0	16-10	20-1	23-7
	Southern Pine	#3	7-11	11-8	14-10	17-6	20-11	6-10	10-1	12-10	15-2	18-1
	Spruce-Pine-Fir	SS	9-8	15-2	19-11	25-5	26-0	9-8	14-10	18-10	23-0	26-0
	Spruce-Pine-Fir	#1	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-Pine-Fir	#2	9-5	14-4	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-Pine-Fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10

(continued)



**TABLE 2308.10.3(1)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Roof Live Load = 20 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	9-10	15-5	20-4	25-11	26-0	9-10	14-7	18-6	22-7	26-0
	Douglas Fir-Larch	#1	9-5	14-0	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas Fir-Larch	#2	8-11	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Douglas Fir-Larch	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	SS	9-3	14-7	19-2	24-6	26-0	9-3	14-4	18-2	22-3	25-9
	Hem-Fir	#1	9-1	13-8	17-4	21-1	24-6	8-1	11-10	15-0	18-4	21-3
	Hem-Fir	#2	8-8	12-11	16-4	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-Fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern Pine	SS	9-8	15-2	19-11	25-5	26-0	9-8	15-2	19-11	25-5	26-0
	Southern Pine	#1	9-5	14-10	19-7	23-7	26-0	9-3	13-8	17-2	20-5	24-4
	Southern Pine	#2	9-3	13-9	17-9	21-2	24-10	8-4	11-11	15-4	18-4	21-6
	Southern Pine	#3	7-3	10-8	13-7	16-0	19-1	6-3	9-3	11-9	13-10	16-6
	Spruce-Pine-Fir	SS	9-1	14-3	18-9	23-11	26-0	9-1	13-7	17-2	21-0	24-4
	Spruce-Pine-Fir	#1	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-Pine-Fir	#2	8-10	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-Pine-Fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
24	Douglas Fir-Larch	SS	9-1	14-4	18-10	23-4	26-0	8-11	13-1	16-7	20-3	23-5
	Douglas Fir-Larch	#1	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas Fir-Larch	#2	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Douglas Fir-Larch	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Hem-Fir	SS	8-7	13-6	17-10	22-9	26-0	8-7	12-10	16-3	19-10	23-0
	Hem-Fir	#1	8-4	12-3	15-6	18-11	21-11	7-3	10-7	13-5	16-4	19-0
	Hem-Fir	#2	7-11	11-7	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-Fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern Pine	SS	8-11	14-1	18-6	23-8	26-0	8-11	14-1	18-6	22-11	26-0
	Southern Pine	#1	8-9	13-9	17-9	21-1	25-2	8-3	12-3	15-4	18-3	21-9
	Southern Pine	#2	8-7	12-3	15-10	18-11	22-2	7-5	10-8	13-9	16-5	19-3
	Southern Pine	#3	6-5	9-6	12-1	14-4	17-1	5-7	8-3	10-6	12-5	14-9
	Spruce-Pine-Fir	SS	8-5	13-3	17-5	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Spruce-Pine-Fir	#1	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-Pine-Fir	#2	8-0	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-Pine-Fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>

**TABLE 2308.10.3(2)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Roof Live Load = 20 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	10-5	16-4	21-7	26-0	26-0	10-5	16-4	21-7	26-0	26-0
	Douglas Fir-Larch	#1	10-0	15-9	20-10	26-0	26-0	10-0	15-4	19-5	23-9	26-0
	Douglas Fir-Larch	#2	9-10	15-6	20-5	25-8	26-0	9-10	14-4	18-2	22-3	25-9
	Douglas Fir-Larch	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Hem-Fir	SS	9-10	15-6	20-5	26-0	26-0	9-10	15-6	20-5	26-0	26-0
	Hem-Fir	#1	9-8	15-2	19-11	25-5	26-0	9-8	14-11	18-11	23-2	26-0
	Hem-Fir	#2	9-2	14-5	19-0	24-3	26-0	9-2	14-2	17-11	21-11	25-5
	Hem-Fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Southern Pine	SS	10-3	16-1	21-2	26-0	26-0	10-3	16-1	21-2	26-0	26-0
	Southern Pine	#1	10-0	15-9	20-10	26-0	26-0	10-0	15-9	20-10	25-10	26-0
	Southern Pine	#2	9-10	15-6	20-5	26-0	26-0	9-10	15-1	19-5	23-2	26-0
	Southern Pine	#3	9-1	13-6	17-2	20-3	24-1	7-11	11-8	14-10	17-6	20-11
	Spruce-Pine-Fir	SS	9-8	15-2	19-11	25-5	26-0	9-8	15-2	19-11	25-5	26-0
	Spruce-Pine-Fir	#1	9-5	14-9	19-6	24-10	26-0	9-5	14-4	18-2	22-3	25-9
	Spruce-Pine-Fir	#2	9-5	14-9	19-6	24-10	26-0	9-5	14-4	18-2	22-3	25-9
	Spruce-Pine-Fir	#3	8-7	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
16	Douglas Fir-Larch	SS	9-6	14-11	19-7	25-0	26-0	9-6	14-11	19-7	24-9	26-0
	Douglas Fir-Larch	#1	9-1	14-4	18-11	23-9	26-0	9-1	13-3	16-10	20-7	23-10
	Douglas Fir-Larch	#2	8-11	14-1	18-2	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Douglas Fir-Larch	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Hem-Fir	SS	8-11	14-1	18-6	23-8	26-0	8-11	14-1	18-6	23-8	26-0
	Hem-Fir	#1	8-9	13-9	18-1	23-1	26-0	8-9	12-11	16-5	20-0	23-3
	Hem-Fir	#2	8-4	13-1	17-3	21-11	25-5	8-4	12-3	15-6	18-11	22-0
	Hem-Fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10
	Southern Pine	SS	9-4	14-7	19-3	24-7	26-0	9-4	14-7	19-3	24-7	26-0
	Southern Pine	#1	9-1	14-4	18-11	24-1	26-0	9-1	14-4	18-10	22-4	26-0
	Southern Pine	#2	8-11	14-1	18-6	23-2	26-0	8-11	13-0	16-10	20-1	23-7
	Southern Pine	#3	7-11	11-8	14-10	17-6	20-11	6-10	10-1	12-10	15-2	18-1
	Spruce-Pine-Fir	SS	8-9	13-9	18-1	23-1	26-0	8-9	13-9	18-1	23-0	26-0
	Spruce-Pine-Fir	#1	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-Pine-Fir	#2	8-7	13-5	17-9	22-3	25-9	8-6	12-5	15-9	19-3	22-4
	Spruce-Pine-Fir	#3	7-5	10-10	13-9	16-9	19-6	6-5	9-5	11-11	14-6	16-10

(continued)

**TABLE 2308.10.3(2)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
**(Roof Live Load = 20 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )**

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	8-11	14-0	18-5	23-7	26-0	8-11	14-0	18-5	22-7	26-0
	Douglas Fir-Larch	#1	8-7	13-6	17-9	21-8	25-2	8-4	12-2	15-4	18-9	21-9
	Douglas Fir-Larch	#2	8-5	13-1	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Douglas Fir-Larch	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	SS	8-5	13-3	17-5	22-3	26-0	8-5	13-3	17-5	22-3	25-9
	Hem-Fir	#1	8-3	12-11	17-1	21-1	24-6	8-1	11-10	15-0	18-4	21-3
	Hem-Fir	#2	7-10	12-4	16-3	20-0	23-2	7-8	11-2	14-2	17-4	20-1
	Hem-Fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
	Southern Pine	SS	8-9	13-9	18-1	23-1	26-0	8-9	13-9	18-1	23-1	26-0
	Southern Pine	#1	8-7	13-6	17-9	22-8	26-0	8-7	13-6	17-2	20-5	24-4
	Southern Pine	#2	8-5	13-3	17-5	21-2	24-10	8-4	11-11	15-4	18-4	21-6
	Southern Pine	#3	7-3	10-8	13-7	16-0	19-1	6-3	9-3	11-9	13-10	16-6
	Spruce-Pine-Fir	SS	8-3	12-11	17-1	21-9	26-0	8-3	12-11	17-1	21-0	24-4
	Spruce-Pine-Fir	#1	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-Pine-Fir	#2	8-1	12-8	16-7	20-3	23-6	7-9	11-4	14-4	17-7	20-4
	Spruce-Pine-Fir	#3	6-9	9-11	12-7	15-4	17-9	5-10	8-7	10-10	13-3	15-5
24	Douglas Fir-Larch	SS	8-3	13-0	17-2	21-10	26-0	8-3	13-0	16-7	20-3	23-5
	Douglas Fir-Larch	#1	8-0	12-6	15-10	19-5	22-6	7-5	10-10	13-9	16-9	19-6
	Douglas Fir-Larch	#2	7-10	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Douglas Fir-Larch	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Hem-Fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-10	23-0
	Hem-Fir	#1	7-8	12-0	15-6	18-11	21-11	7-3	10-7	13-5	16-4	19-0
	Hem-Fir	#2	7-3	11-5	14-8	17-10	20-9	6-10	10-0	12-8	15-6	17-11
	Hem-Fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9
	Southern Pine	SS	8-1	12-9	16-10	21-6	26-0	8-1	12-9	16-10	21-6	26-0
	Southern Pine	#1	8-0	12-6	16-6	21-1	25-2	8-0	12-3	15-4	18-3	21-9
	Southern Pine	#2	7-10	12-3	15-10	18-11	22-2	7-5	10-8	13-9	16-5	19-3
	Southern Pine	#3	6-5	9-6	12-1	14-4	17-1	5-7	8-3	10-6	12-5	14-9
	Spruce-Pine-Fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-4	18-9	21-9
	Spruce-Pine-Fir	#1	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-Pine-Fir	#2	7-6	11-9	14-10	18-2	21-0	6-11	10-2	12-10	15-8	18-3
	Spruce-Pine-Fir	#3	6-1	8-10	11-3	13-8	15-11	5-3	7-8	9-9	11-10	13-9

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**TABLE 2308.10.3(3)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 30 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	10-0	15-9	20-9	26-0	26-0	10-0	15-9	20-1	24-6	26-0
	Douglas Fir-Larch	#1	9-8	14-9	18-8	22-9	26-0	9-0	13-2	16-8	20-4	23-7
	Douglas Fir-Larch	#2	9-5	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Douglas Fir-Larch	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Hem-Fir	SS	9-6	14-10	19-7	25-0	26-0	9-6	14-10	19-7	24-1	26-0
	Hem-Fir	#1	9-3	14-4	18-2	22-2	25-9	8-9	12-10	16-3	19-10	23-0
	Hem-Fir	#2	8-10	13-7	17-2	21-0	24-4	8-4	12-2	15-4	18-9	21-9
	Hem-Fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern Pine	SS	9-10	15-6	20-5	26-0	26-0	9-10	15-6	20-5	26-0	26-0
	Southern Pine	#1	9-8	15-2	20-0	24-9	26-0	9-8	14-10	18-8	22-2	26-0
	Southern Pine	#2	9-6	14-5	18-8	22-3	26-0	9-0	12-11	16-8	19-11	23-4
	Southern Pine	#3	7-7	11-2	14-3	16-10	20-0	6-9	10-0	12-9	15-1	17-11
	Spruce-Pine-Fir	SS	9-3	14-7	19-2	24-6	26-0	9-3	14-7	18-8	22-9	26-0
	Spruce-Pine-Fir	#1	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-Pine-Fir	#2	9-1	13-9	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Spruce-Pine-Fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas Fir-Larch	SS	9-1	14-4	18-10	23-9	26-0	9-1	13-9	17-5	21-3	24-8
	Douglas Fir-Larch	#1	8-9	12-9	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas Fir-Larch	#2	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Douglas Fir-Larch	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Hem-Fir	SS	8-7	13-6	17-10	22-9	26-0	8-7	13-6	17-1	20-10	24-2
	Hem-Fir	#1	8-5	12-5	15-9	19-3	22-3	7-7	11-1	14-1	17-2	19-11
	Hem-Fir	#2	8-0	11-9	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-Fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern Pine	SS	8-11	14-1	18-6	23-8	26-0	8-11	14-1	18-6	23-8	26-0
	Southern Pine	#1	8-9	13-9	18-1	21-5	25-7	8-8	12-10	16-2	19-2	22-10
	Southern Pine	#2	8-7	12-6	16-2	19-3	22-7	7-10	11-2	14-5	17-3	20-2
	Southern Pine	#3	6-7	9-8	12-4	14-7	17-4	5-10	8-8	11-0	13-0	15-6
	Spruce-Pine-Fir	SS	8-5	13-3	17-5	22-1	25-7	8-5	12-9	16-2	19-9	22-10
	Spruce-Pine-Fir	#1	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-Pine-Fir	#2	8-2	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-Pine-Fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6

(continued)



**TABLE 2308.10.3(3)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 30 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	8-7	13-6	17-9	21-8	25-2	8-7	12-6	15-10	19-5	22-6
	Douglas Fir-Larch	#1	7-11	11-8	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Douglas Fir-Larch	#2	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Douglas Fir-Larch	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Hem-Fir	SS	8-1	12-9	16-9	21-4	24-8	8-1	12-4	15-7	19-1	22-1
	Hem-Fir	#1	7-9	11-4	14-4	17-7	20-4	6-11	10-2	12-10	15-8	18-2
	Hem-Fir	#2	7-4	10-9	13-7	16-7	19-3	6-7	9-7	12-2	14-10	17-3
	Hem-Fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Southern Pine	SS	8-5	13-3	17-5	22-3	26-0	8-5	13-3	17-5	22-0	25-9
	Southern Pine	#1	8-3	13-0	16-6	19-7	23-4	7-11	11-9	14-9	17-6	20-11
	Southern Pine	#2	7-11	11-5	14-9	17-7	20-7	7-1	10-2	13-2	15-9	18-5
	Southern Pine	#3	6-0	8-10	11-3	13-4	15-10	5-4	7-11	10-1	11-11	14-2
	Spruce-Pine-Fir	SS	7-11	12-5	16-5	20-2	23-4	7-11	11-8	14-9	18-0	20-11
	Spruce-Pine-Fir	#1	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-Pine-Fir	#2	7-5	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-Pine-Fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
24	Douglas Fir-Larch	SS	7-11	12-6	15-10	19-5	22-6	7-8	11-3	14-2	17-4	20-1
	Douglas Fir-Larch	#1	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas Fir-Larch	#2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Douglas Fir-Larch	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Hem-Fir	SS	7-6	11-10	15-7	19-1	22-1	7-6	11-0	13-11	17-0	19-9
	Hem-Fir	#1	6-11	10-2	12-10	15-8	18-2	6-2	9-1	11-6	14-0	16-3
	Hem-Fir	#2	6-7	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern Pine	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	19-8	23-0
	Southern Pine	#1	7-8	11-9	14-9	17-6	20-11	7-1	10-6	13-2	15-8	18-8
	Southern Pine	#2	7-1	10-2	13-2	15-9	18-5	6-4	9-2	11-9	14-1	16-6
	Southern Pine	#3	5-4	7-11	10-1	11-11	14-2	4-9	7-1	9-0	10-8	12-8
	Spruce-Pine-Fir	SS	7-4	11-7	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#1	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-Pine-Fir	#2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-Pine-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**TABLE 2308.10.3(4)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 50 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	8-5	13-3	17-6	22-4	26-0	8-5	13-3	17-0	20-9	24-10
	Douglas Fir-Larch	#1	8-2	12-0	15-3	18-7	21-7	7-7	11-2	14-1	17-3	20-0
	Douglas Fir-Larch	#2	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Douglas Fir-Larch	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Hem-Fir	SS	8-0	12-6	16-6	21-1	25-6	8-0	12-6	16-6	20-4	23-7
	Hem-Fir	#1	7-10	11-9	14-10	18-1	21-0	7-5	10-10	13-9	16-9	19-5
	Hem-Fir	#2	7-5	11-1	14-0	17-2	19-11	7-0	10-3	13-0	15-10	18-5
	Hem-Fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern Pine	SS	8-4	13-0	17-2	21-11	26-0	8-4	13-0	17-2	21-11	26-0
	Southern Pine	#1	8-2	12-10	16-10	20-3	24-1	8-2	12-6	15-9	18-9	22-4
	Southern Pine	#2	8-0	11-9	15-3	18-2	21-3	7-7	10-11	14-1	16-10	19-9
	Southern Pine	#3	6-2	9-2	11-8	13-9	16-4	5-9	8-5	10-9	12-9	15-2
	Spruce-Pine-Fir	SS	7-10	12-3	16-2	20-8	24-1	7-10	12-3	15-9	19-3	22-4
	Spruce-Pine-Fir	#1	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#2	7-8	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas Fir-Larch	SS	7-8	12-1	15-10	19-5	22-6	7-8	11-7	14-8	17-11	20-10
	Douglas Fir-Larch	#1	7-1	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas Fir-Larch	#2	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Douglas Fir-Larch	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Hem-Fir	SS	7-3	11-5	15-0	19-1	22-1	7-3	11-5	14-5	17-8	20-5
	Hem-Fir	#1	6-11	10-2	12-10	15-8	18-2	6-5	9-5	11-11	14-6	16-10
	Hem-Fir	#2	6-7	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern Pine	SS	7-6	11-10	15-7	19-11	24-3	7-6	11-10	15-7	19-11	23-10
	Southern Pine	#1	7-5	11-7	14-9	17-6	20-11	7-4	10-10	13-8	16-2	19-4
	Southern Pine	#2	7-1	10-2	13-2	15-9	18-5	6-7	9-5	12-2	14-7	17-1
	Southern Pine	#3	5-4	7-11	10-1	11-11	14-2	4-11	7-4	9-4	11-0	13-1
	Spruce-Pine-Fir	SS	7-1	11-2	14-8	18-0	20-11	7-1	10-9	13-8	16-8	19-4
	Spruce-Pine-Fir	#1	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-Pine-Fir	#2	6-8	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-Pine-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3

(continued)

**TABLE 2308.10.3(4)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 50 pounds per square foot, Ceiling Not Attached to Rafters,  $L/\Delta = 180$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	7-3	11-4	14-6	17-8	20-6	7-3	10-7	13-5	16-5	19-0
	Douglas Fir-Larch	#1	6-6	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas Fir-Larch	#2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Douglas Fir-Larch	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
	Hem-Fir	SS	6-10	10-9	14-2	17-5	20-2	6-10	10-5	13-2	16-1	18-8
	Hem-Fir	#1	6-4	9-3	11-9	14-4	16-7	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	#2	6-0	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-Fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
	Southern Pine	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-7	21-9
	Southern Pine	#1	7-0	10-8	13-5	16-0	19-1	6-8	9-11	12-5	14-10	17-8
	Southern Pine	#2	6-6	9-4	12-0	14-4	16-10	6-0	8-8	11-2	13-4	15-7
	Southern Pine	#3	4-11	7-3	9-2	10-10	12-11	4-6	6-8	8-6	10-1	12-0
	Spruce-Pine-Fir	SS	6-8	10-6	13-5	16-5	19-1	6-8	9-10	12-5	15-3	17-8
	Spruce-Pine-Fir	#1	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
24	Douglas Fir-Larch	SS	6-8	10-3	13-0	15-10	18-4	6-6	9-6	12-0	14-8	17-0
	Douglas Fir-Larch	#1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas Fir-Larch	#2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Douglas Fir-Larch	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Hem-Fir	SS	6-4	9-11	12-9	15-7	18-0	6-4	9-4	11-9	14-5	16-8
	Hem-Fir	#1	5-8	8-3	10-6	12-10	14-10	5-3	7-8	9-9	11-10	13-9
	Hem-Fir	#2	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-Fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern Pine	SS	6-7	10-4	13-8	17-5	21-0	6-7	10-4	13-8	16-7	19-5
	Southern Pine	#1	6-5	9-7	12-0	14-4	17-1	6-0	8-10	11-2	13-3	15-9
	Southern Pine	#2	5-10	8-4	10-9	12-10	15-1	5-5	7-9	10-0	11-11	13-11
	Southern Pine	#3	4-4	6-5	8-3	9-9	11-7	4-1	6-0	7-7	9-0	10-8
	Spruce-Pine-Fir	SS	6-2	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Spruce-Pine-Fir	#1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-Pine-Fir	#2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-Pine-Fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**TABLE 2308.10.3(5)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 30 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	9-1	14-4	18-10	24-1	26-0	9-1	14-4	18-10	24-1	26-0
	Douglas Fir-Larch	#1	8-9	13-9	18-2	22-9	26-0	8-9	13-2	16-8	20-4	23-7
	Douglas Fir-Larch	#2	8-7	13-6	17-5	21-4	24-8	8-5	12-4	15-7	19-1	22-1
	Douglas Fir-Larch	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Hem-Fir	SS	8-7	13-6	17-10	22-9	26-0	8-7	13-6	17-10	22-9	26-0
	Hem-Fir	#1	8-5	13-3	17-5	22-2	25-9	8-5	12-10	16-3	19-10	23-0
	Hem-Fir	#2	8-0	12-7	16-7	21-0	24-4	8-0	12-2	15-4	18-9	21-9
	Hem-Fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Southern Pine	SS	8-11	14-1	18-6	23-8	26-0	8-11	14-1	18-6	23-8	26-0
	Southern Pine	#1	8-9	13-9	18-2	23-2	26-0	8-9	13-9	18-2	22-2	26-0
	Southern Pine	#2	8-7	13-6	17-10	22-3	26-0	8-7	12-11	16-8	19-11	23-4
	Southern Pine	#3	7-7	11-2	14-3	16-10	20-0	6-9	10-0	12-9	15-1	17-11
	Spruce-Pine-Fir	SS	8-5	13-3	17-5	22-3	26-0	8-5	13-3	17-5	22-3	26-0
	Spruce-Pine-Fir	#1	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1
	Spruce-Pine-Fir	#2	8-3	12-11	17-0	21-4	24-8	8-3	12-4	15-7	19-1	22-1
	Spruce-Pine-Fir	#3	7-1	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
16	Douglas Fir-Larch	SS	8-3	13-0	17-2	21-10	26-0	8-3	13-0	17-2	21-3	24-8
	Douglas Fir-Larch	#1	8-0	12-6	16-2	19-9	22-10	7-10	11-5	14-5	17-8	20-5
	Douglas Fir-Larch	#2	7-10	11-11	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Douglas Fir-Larch	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Hem-Fir	SS	7-10	12-3	16-2	20-8	25-1	7-10	12-3	16-2	20-8	24-2
	Hem-Fir	#1	7-8	12-0	15-9	19-3	22-3	7-7	11-1	14-1	17-2	19-11
	Hem-Fir	#2	7-3	11-5	14-11	18-2	21-1	7-2	10-6	13-4	16-3	18-10
	Hem-Fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6
	Southern Pine	SS	8-1	12-9	16-10	21-6	26-0	8-1	12-9	16-10	21-6	26-0
	Southern Pine	#1	8-0	12-6	16-6	21-1	25-7	8-0	12-6	16-2	19-2	22-10
	Southern Pine	#2	7-10	12-3	16-2	19-3	22-7	7-10	11-2	14-5	17-3	20-2
	Southern Pine	#3	6-7	9-8	12-4	14-7	17-4	5-10	8-8	11-0	13-0	15-6
	Spruce-Pine-Fir	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-10	19-9	22-10
	Spruce-Pine-Fir	#1	7-6	11-9	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-Pine-Fir	#2	7-6	11-9	15-1	18-5	21-5	7-3	10-8	13-6	16-6	19-2
	Spruce-Pine-Fir	#3	6-2	9-0	11-5	13-11	16-2	5-6	8-1	10-3	12-6	14-6

(continued)



**TABLE 2308.10.3(5)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
**(Ground Snow Load = 30 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )**

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	7-9	12-3	16-1	20-7	25-0	7-9	12-3	15-10	19-5	22-6
	Douglas Fir-Larch	#1	7-6	11-8	14-9	18-0	20-11	7-1	10-5	13-2	16-1	18-8
	Douglas Fir-Larch	#2	7-4	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Douglas Fir-Larch	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Hem-Fir	SS	7-4	11-7	15-3	19-5	23-7	7-4	11-7	15-3	19-1	22-1
	Hem-Fir	#1	7-2	11-4	14-4	17-7	20-4	6-11	10-2	12-10	15-8	18-2
	Hem-Fir	#2	6-10	10-9	13-7	16-7	19-3	6-7	9-7	12-2	14-10	17-3
	Hem-Fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
	Southern Pine	SS	7-8	12-0	15-10	20-2	24-7	7-8	12-0	15-10	20-2	24-7
	Southern Pine	#1	7-6	11-9	15-6	19-7	23-4	7-6	11-9	14-9	17-6	20-11
	Southern Pine	#2	7-4	11-5	14-9	17-7	20-7	7-1	10-2	13-2	15-9	18-5
	Southern Pine	#3	6-0	8-10	11-3	13-4	15-10	5-4	7-11	10-1	11-11	14-2
	Spruce-Pine-Fir	SS	7-2	11-4	14-11	19-0	23-1	7-2	11-4	14-9	18-0	20-11
	Spruce-Pine-Fir	#1	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-Pine-Fir	#2	7-0	10-11	13-9	16-10	19-6	6-8	9-9	12-4	15-1	17-6
	Spruce-Pine-Fir	#3	5-7	8-3	10-5	12-9	14-9	5-0	7-4	9-4	11-5	13-2
24	Douglas Fir-Larch	SS	7-3	11-4	15-0	19-1	22-6	7-3	11-3	14-2	17-4	20-1
	Douglas Fir-Larch	#1	7-0	10-5	13-2	16-1	18-8	6-4	9-4	11-9	14-5	16-8
	Douglas Fir-Larch	#2	6-8	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Douglas Fir-Larch	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Hem-Fir	SS	6-10	10-9	14-2	18-0	21-11	6-10	10-9	13-11	17-0	19-9
	Hem-Fir	#1	6-8	10-2	12-10	15-8	18-2	6-2	9-1	11-6	14-0	16-3
	Hem-Fir	#2	6-4	9-7	12-2	14-10	17-3	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10
	Southern Pine	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-10
	Southern Pine	#1	7-0	10-11	14-5	17-6	20-11	7-0	10-6	13-2	15-8	18-8
	Southern Pine	#2	6-10	10-2	13-2	15-9	18-5	6-4	9-2	11-9	14-1	16-6
	Southern Pine	#3	5-4	7-11	10-1	11-11	14-2	4-9	7-1	9-0	10-8	12-8
	Spruce-Pine-Fir	SS	6-8	10-6	13-10	17-8	20-11	6-8	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#1	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-Pine-Fir	#2	6-6	9-9	12-4	15-1	17-6	5-11	8-8	11-0	13-6	15-7
	Spruce-Pine-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-6	6-7	8-4	10-2	11-10

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**TABLE 2308.10.3(6)**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 50 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
12	Douglas Fir-Larch	SS	7-8	12-1	15-11	20-3	24-8	7-8	12-1	15-11	20-3	24-0
	Douglas Fir-Larch	#1	7-5	11-7	15-3	18-7	21-7	7-5	11-2	14-1	17-3	20-0
	Douglas Fir-Larch	#2	7-3	11-3	14-3	17-5	20-2	7-1	10-5	13-2	16-1	18-8
	Douglas Fir-Larch	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Hem-Fir	SS	7-3	11-5	15-0	19-2	23-4	7-3	11-5	15-0	19-2	23-4
	Hem-Fir	#1	7-1	11-2	14-8	18-1	21-0	7-1	10-10	13-9	16-9	19-5
	Hem-Fir	#2	6-9	10-8	14-0	17-2	19-11	6-9	10-3	13-0	15-10	18-5
	Hem-Fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Southern Pine	SS	7-6	11-0	15-7	19-11	24-3	7-6	11-10	15-7	19-11	24-3
	Southern Pine	#1	7-5	11-7	15-4	19-7	23-9	7-5	11-7	15-4	18-9	22-4
	Southern Pine	#2	7-3	11-5	15-0	18-2	21-3	7-3	10-11	14-1	16-10	19-9
	Southern Pine	#3	6-2	9-2	11-8	13-9	16-4	5-9	8-5	10-9	12-9	15-2
	Spruce-Pine-Fir	SS	7-1	11-2	14-8	18-9	22-10	7-1	11-2	14-8	18-9	22-4
	Spruce-Pine-Fir	#1	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#2	6-11	10-11	14-3	17-5	20-2	6-11	10-5	13-2	16-1	18-8
	Spruce-Pine-Fir	#3	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
16	Douglas Fir-Larch	SS	7-0	11-0	14-5	18-5	22-5	7-0	11-0	14-5	17-11	20-10
	Douglas Fir-Larch	#1	6-9	10-5	13-2	16-1	18-8	6-7	9-8	12-2	14-11	17-3
	Douglas Fir-Larch	#2	6-7	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Douglas Fir-Larch	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Hem-Fir	SS	6-7	10-4	13-8	17-5	21-2	6-7	10-4	13-8	17-5	20-5
	Hem-Fir	#1	6-5	10-2	12-10	15-8	18-2	6-5	9-5	11-11	14-6	16-10
	Hem-Fir	#2	6-2	9-7	12-2	14-10	17-3	6-1	8-11	11-3	13-9	15-11
	Hem-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3
	Southern Pine	SS	6-10	10-9	14-2	18-1	22-0	6-10	10-9	14-2	18-1	22-0
	Southern Pine	#1	6-9	10-7	13-11	17-6	20-11	6-9	10-7	13-8	16-2	19-4
	Southern Pine	#2	6-7	10-2	13-2	15-9	18-5	6-7	9-5	12-2	14-7	17-1
	Southern Pine	#3	5-4	7-11	10-1	11-11	14-2	4-11	7-4	9-4	11-0	13-1
	Spruce-Pine-Fir	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	16-8	19-4
	Spruce-Pine-Fir	#1	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-Pine-Fir	#2	6-4	9-9	12-4	15-1	17-6	6-2	9-0	11-5	13-11	16-2
	Spruce-Pine-Fir	#3	5-0	7-4	9-4	11-5	13-2	4-8	6-10	8-8	10-6	12-3

(continued)

**TABLE 2308.10.3(6)—continued**  
**RAFTER SPANS FOR COMMON LUMBER SPECIES**  
 (Ground Snow Load = 50 pounds per square foot, Ceiling Attached to Rafters,  $L/\Delta = 240$ )

RAFTER SPACING (inches)	SPECIES AND GRADE		DEAD LOAD = 10 pounds per square foot					DEAD LOAD = 20 pounds per square foot				
			2×4	2×6	2×8	2×10	2×12	2×4	2×6	2×8	2×10	2×12
			Maximum rafter spans									
			(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)	(ft. - in.)
19.2	Douglas Fir-Larch	SS	6-7	10-4	13-7	17-4	20-6	6-7	10-4	13-5	16-5	19-0
	Douglas Fir-Larch	#1	6-4	9-6	12-0	14-8	17-1	6-0	8-10	11-2	13-7	15-9
	Douglas Fir-Larch	#2	6-1	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Douglas Fir-Larch	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
	Hem-Fir	SS	6-2	9-9	12-10	16-5	19-11	6-2	9-9	12-10	16-1	18-8
	Hem-Fir	#1	6-1	9-3	11-9	14-4	16-7	5-10	8-7	10-10	13-3	15-5
	Hem-Fir	#2	5-9	8-9	11-1	13-7	15-9	5-7	8-1	10-3	12-7	14-7
	Hem-Fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
	Southern Pine	SS	6-5	10-2	13-4	17-0	20-9	6-5	10-2	13-4	17-0	20-9
	Southern Pine	#1	6-4	9-11	13-1	16-0	19-1	6-4	9-11	12-5	14-10	17-8
	Southern Pine	#2	6-2	9-4	12-0	14-4	16-10	6-0	8-8	11-2	13-4	15-7
	Southern Pine	#3	4-11	7-3	9-2	10-10	12-11	4-6	6-8	8-6	10-1	12-0
	Spruce-Pine-Fir	SS	6-1	9-6	12-7	16-0	19-1	6-1	9-6	12-5	15-3	17-8
	Spruce-Pine-Fir	#1	5-11	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#2	5-11	8-11	11-3	13-9	15-11	5-7	8-3	10-5	12-9	14-9
	Spruce-Pine-Fir	#3	4-7	6-9	8-6	10-5	12-1	4-3	6-3	7-11	9-7	11-2
24	Douglas Fir-Larch	SS	6-1	9-7	12-7	15-10	18-4	6-1	9-6	12-0	14-8	17-0
	Douglas Fir-Larch	#1	5-10	8-6	10-9	13-2	15-3	5-5	7-10	10-0	12-2	14-1
	Douglas Fir-Larch	#2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Douglas Fir-Larch	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Hem-Fir	SS	5-9	9-1	11-11	15-12	18-0	5-9	9-1	11-9	14-5	16-8
	Hem-Fir	#1	5-8	8-3	10-6	12-10	14-10	5-3	7-8	9-9	11-10	13-9
	Hem-Fir	#2	5-4	7-10	9-11	12-1	14-1	4-11	7-3	9-2	11-3	13-0
	Hem-Fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0
	Southern Pine	SS	6-0	9-5	12-5	15-10	19-3	6-0	9-5	12-5	15-10	19-3
	Southern Pine	#1	5-10	9-3	12-0	14-4	17-1	5-10	8-10	11-2	13-3	15-9
	Southern Pine	#2	5-9	8-4	10-9	12-10	15-1	5-5	7-9	10-0	11-11	13-11
	Southern Pine	#3	4-4	6-5	8-3	9-9	11-7	4-1	6-0	7-7	9-0	10-8
	Spruce-Pine-Fir	SS	5-8	8-10	11-8	14-8	17-1	5-8	8-10	11-2	13-7	15-9
	Spruce-Pine-Fir	#1	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-Pine-Fir	#2	5-5	7-11	10-1	12-4	14-3	5-0	7-4	9-4	11-5	13-2
	Spruce-Pine-Fir	#3	4-1	6-0	7-7	9-4	10-9	3-10	5-7	7-1	8-7	10-0

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.9 N/m<sup>2</sup>.

**2308.10.4 Ceiling joist and rafter framing.** Rafters shall be framed directly opposite each other at the ridge. There shall be a ridge board at least 1-inch (25 mm) nominal thickness at ridges and not less in depth than the cut end of the rafter. At valleys and hips, there shall be a single valley or hip rafter not less than 2-inch (51 mm) nominal thickness and not less in depth than the cut end of the rafter.

**2308.10.4.1 Ceiling joist and rafter connections.** Ceiling joists and rafters shall be nailed to each other and the assembly shall be nailed to the top wall plate in accordance with Tables 2304.9.1 and 2308.10.1. Ceiling joists shall be continuous or securely joined where they meet over interior partitions and fastened to adjacent rafters in accordance with Tables 2308.10.4.1 and 2304.9.1 to provide a continuous rafter tie across the building where such joists are parallel to the rafters. Ceiling joists shall have a bearing surface of not less than 1½ inches (38 mm) on the top plate at each end. Where ceiling joists are not parallel to rafters, an equivalent rafter tie shall be installed in a manner to provide a continuous tie across the building, at a spacing of not more than 4 feet (1219 mm) o.c. The connections shall be in accordance with Tables 2308.10.4.1 and 2304.9.1, or connections of equivalent capacities shall be provided. Where ceiling joists or rafter ties are not provided at the top of the rafter support walls, the ridge formed by these rafters shall also be supported by a girder conforming to Section 2308.4. Rafter ties shall be spaced not more than 4 feet (1219 mm) o.c. Rafter tie connections shall be based on the equivalent rafter spacing in Table 2308.10.4.1. Where rafter ties are spaced at 32 inches (813 mm) o.c., the number of 16d common nails shall be two times the number specified for rafters spaced 16 inches (406 mm) o.c., with a minimum of four 16d common nails where no snow loads are indicated. Where rafter ties are spaced at 48 inches (1219 mm) o.c., the number of 16d common nails shall be two times the number specified for rafters spaced 24 inches (610 mm) o.c., with a minimum of six 16d common nails where no snow loads are indicated. Rafter/ceiling joist connections and rafter/tie connections shall be of sufficient size and number to prevent splitting from nailing.

**2308.10.4.2 Notches and holes.** Notching at the ends of rafters or ceiling joists shall not exceed one-fourth the depth. Notches in the top or bottom of the rafter or ceiling joist shall not exceed one-sixth the depth and shall not be located in the middle one-third of the span, except that a notch not exceeding one-third of the depth is permitted in the top of the rafter or ceiling joist not further from the face of the support than the depth of the member. Holes bored in rafters or ceiling joists shall not be within 2 inches (51 mm) of the top and bot-

tom and their diameter shall not exceed one-third the depth of the member.

**2308.10.4.3 Framing around openings.** Trimmer and header rafters shall be doubled, or of lumber of equivalent cross section, where the span of the header exceeds 4 feet (1219 mm). The ends of header rafters more than 6 feet (1829 mm) long shall be supported by framing anchors or rafter hangers unless bearing on a beam, partition or wall.

**2308.10.5 Purlins.** Purlins to support roof loads are permitted to be installed to reduce the span of rafters within allowable limits and shall be supported by struts to bearing walls. The maximum span of 2-inch by 4-inch (51 mm by 102 mm) purlins shall be 4 feet (1219 mm). The maximum span of the 2-inch by 6-inch (51 mm by 152 mm) purlin shall be 6 feet (1829 mm), but in no case shall the purlin be smaller than the supported rafter. Struts shall not be smaller than 2-inch by 4-inch (51 mm by 102 mm) members. The unbraced length of struts shall not exceed 8 feet (2438 mm) and the minimum slope of the struts shall not be less than 45 degrees (0.79 rad) from the horizontal.

**2308.10.6 Blocking.** Roof rafters and ceiling joists shall be supported laterally to prevent rotation and lateral displacement in accordance with the provisions of Section 2308.8.5.

**2308.10.7 Engineered wood products.** Prefabricated wood I-joists, structural glued-laminated timber and structural composite lumber shall not be notched or drilled except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a registered design professional.

**2308.10.8 Roof sheathing.** Roof sheathing shall be in accordance with Tables 2304.7(3) and 2304.7(5) for wood structural panels, and Tables 2304.7(1) and 2304.7(2) for lumber and shall comply with Section 2304.7.2.

**2308.10.8.1 Joints.** Joints in lumber sheathing shall occur over supports unless approved end-matched lumber is used, in which case each piece shall bear on at least two supports.

**2308.10.9 Roof planking.** Planking shall be designed in accordance with the general provisions of this code. In lieu of such design, 2-inch (51 mm) tongue-and-groove planking is permitted in accordance with Table 2308.10.9. Joints in such planking are permitted to be randomly spaced, provided the system is applied to not less than three continuous spans, planks are center matched and end matched or splined, each plank bears on at least one support, and joints are separated by at least 24 inches (610 mm) in adjacent pieces.



**TABLE 2308.10.4.1  
RAFTER TIE CONNECTIONS<sup>g</sup>**

RAFTER SLOPE	TIE SPACING (inches)	NO SNOW LOAD				GROUND SNOW LOAD (pound per square foot)							
						30 pounds per square foot				50 pounds per square foot			
		Roof span (feet)											
		12	20	28	36	12	20	28	36	12	20	28	36
Required number of 16d common (3 1/2" x 0.162") nails <sup>a, b</sup> per connection <sup>c, d, e, f</sup>													
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15
	16	5	7	10	13	5	8	11	14	6	11	15	20
	24	7	11	15	19	7	11	16	21	9	16	23	30
	32	10	14	19	25	10	16	22	28	12	27	30	40
	48	14	21	29	37	14	32	36	42	18	32	46	60
4:12	12	3	4	5	6	3	5	6	8	4	6	9	11
	16	3	5	7	8	4	6	8	11	5	8	12	15
	24	4	7	10	12	5	9	12	16	7	12	17	22
	32	6	9	13	16	8	12	16	22	10	16	24	30
	48	8	14	19	24	10	18	24	32	14	24	34	44
5:12	12	3	3	4	5	3	4	5	7	3	5	7	9
	16	3	4	5	7	3	5	7	9	4	7	9	12
	24	4	6	8	10	4	7	10	13	6	10	14	18
	32	5	8	10	13	6	10	14	18	8	14	18	24
	48	7	11	15	20	8	14	20	26	12	20	28	36
7:12	12	3	3	3	4	3	3	4	5	3	4	5	7
	16	3	3	4	5	3	4	5	6	3	5	7	9
	24	3	4	6	7	3	5	7	9	4	7	10	13
	32	4	6	8	10	4	8	10	12	6	10	14	18
	48	5	8	11	14	6	10	14	18	9	14	20	26
9:12	12	3	3	3	3	3	3	3	4	3	3	4	5
	16	3	3	3	4	3	3	4	5	3	4	5	7
	24	3	3	5	6	3	4	6	7	3	6	8	10
	32	3	4	6	8	4	6	8	10	5	8	10	14
	48	4	6	9	11	5	8	12	14	7	12	16	20
12:12	12	3	3	3	3	3	3	3	3	3	3	3	4
	16	3	3	3	3	3	3	3	4	3	3	4	5
	24	3	3	3	4	3	3	4	6	3	4	6	8
	32	3	3	4	5	3	5	6	8	4	6	8	10
	48	3	4	6	7	4	7	8	12	6	8	12	16

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.8 N/m<sup>2</sup>.

a. 40d box (5" x 0.162") or 16d sinker (3 1/4" x 0.148") nails are permitted to be substituted for 16d common (3 1/2" x 0.162") nails.

b. Nailing requirements are permitted to be reduced 25 percent if nails are clinched.

c. Rafter tie heel joint connections are not required where the ridge is supported by a load-bearing wall, header or ridge beam.

d. When intermediate support of the rafter is provided by vertical struts or purlins to a load-bearing wall, the tabulated heel joint connection requirements are permitted to be reduced proportionally to the reduction in span.

e. Equivalent nailing patterns are required for ceiling joist to ceiling joist lap splices.

f. Connected members shall be of sufficient size to prevent splitting due to nailing.

g. For snow loads less than 30 pounds per square foot, the required number of nails is permitted to be reduced by multiplying by the ratio of actual snow load plus 10 divided by 40, but not less than the number required for no snow load.

**TABLE 2308.10.9  
ALLOWABLE SPANS FOR 2-INCH TONGUE-AND-GROOVE DECKING**

SPAN <sup>a</sup> (feet)	LIVE LOAD (pound per square foot)	DEFLECTION LIMIT	BENDING STRESS (f) (pound per square inch)	MODULUS OF ELASTICITY (E) (pound per square inch)
<b>Roofs</b>				
4	20	1/240 1/360	160	170,000 256,000
	30	1/240 1/360	210	256,000 384,000
	40	1/240 1/360	270	340,000 512,000
4.5	20	1/240 1/360	200	242,000 305,000
	30	1/240 1/360	270	363,000 405,000
	40	1/240 1/360	350	484,000 725,000
5.0	20	1/240 1/360	250	332,000 500,000
	30	1/240 1/360	330	495,000 742,000
	40	1/240 1/360	420	660,000 1,000,000
5.5	20	1/240 1/360	300	442,000 660,000
	30	1/240 1/360	400	662,000 998,000
	40	1/240 1/360	500	884,000 1,330,000
6.0	20	1/240 1/360	360	575,000 862,000
	30	1/240 1/360	480	862,000 1,295,000
	40	1/240 1/360	600	1,150,000 1,730,000
6.5	20	1/240 1/360	420	595,000 892,000
	30	1/240 1/360	560	892,000 1,340,000
	40	1/240 1/360	700	1,190,000 1,730,000
7.0	20	1/240 1/360	490	910,000 1,360,000
	30	1/240 1/360	650	1,370,000 2,000,000
	40	1/240 1/360	810	1,820,000 2,725,000

(continued)

**TABLE 2308.10.9—continued**  
**ALLOWABLE SPANS FOR 2-INCH TONGUE-AND-GROOVE DECKING**

SPAN <sup>a</sup> (feet)	LIVE LOAD (pound per square foot)	DEFLECTION LIMIT	BENDING STRESS (f) (pound per square inch)	MODULUS OF ELASTICITY (E) (pound per square inch)
<b>Roofs</b>				
7.5	20	1/240 1/360	560	1,125,000 1,685,000
	30	1/240 1/360	750	1,685,000 2,530,000
	40	1/240 1/360	930	2,250,000 3,380,000
8.0	20	1/240 1/360	640	1,360,000 2,040,000
	30	1/240 1/360	850	2,040,000 3,060,000
<b>Floors</b>				
4	40	1/360	840	1,000,000
4.5			950	1,300,000
5.0			1,060	1,600,000

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kN/m<sup>2</sup>, 1 pound per square inch = 0.00689 N/mm<sup>2</sup>.

a. Spans are based on simple beam action with 10 pounds per square foot dead load and provisions for a 300-pound concentrated load on a 12-inch width of decking. Random layup is permitted in accordance with the provisions of Section 2308.10.9. Lumber thickness is 1½ inches nominal.

**2308.10.10 Wood trusses.** Wood trusses shall be designed in accordance with Section 2303.4.

**2308.10.11 Attic ventilation.** For attic ventilation, see Section 1203.2.

**2308.11 Additional requirements for conventional construction in Seismic Design Category B or C.** Structures of conventional light-frame construction in Seismic Design Category B or C, as determined in Section 1613, shall comply with Sections 2308.11.1 through 2308.11.3, in addition to the provisions of Sections 2308.1 through 2308.10.

**2308.11.1 Number of stories.** Structures of conventional light-frame construction shall not exceed two stories above grade plane in Seismic Design Category C.

**2308.11.2 Concrete or masonry.** Concrete or masonry walls and stone or masonry veneer shall not extend above a basement.

**Exceptions:**

1. Masonry stone and masonry veneer is permitted to be used in the first two stories above grade plane or the first three stories above grade plane where the lowest story has concrete or masonry walls in Seismic Design Category B, provided that structural use panel wall bracing is used and the length of bracing provided is one- and one-half times the required length as determined in Table 2308.9.3(1).
2. Stone and masonry veneer is permitted to be used in the first story above grade plane or the first two stories above grade plane where the lowest story has concrete or masonry walls in Seismic Design Category B or C.
3. Stone and masonry veneer is permitted to be used in both stories of buildings with two stories above grade plane in Seismic Design Categories

B and C, provided the following criteria are met:

- 3.1. Type of brace per Section 2308.9.3 shall be Method 3 and the allowable shear capacity in accordance with Table 2306.3 shall be a minimum of 350 plf (5108 N/m).
- 3.2. Braced wall panels in the second story shall be located in accordance with Section 2308.9.3 and not more than 25 feet (7620 mm) on center, and the total length of braced wall panels shall be not less than 25 percent of the braced wall line length. Braced wall panels in the first story shall be located in accordance with Section 2308.9.3 and not more than 25 feet (7620 mm) on center, and the total length of braced wall panels shall be not less than 45 percent of the braced wall line length.
- 3.3. Hold-down connectors shall be provided at the ends of each braced wall panel for the allowable design of 2,000 pounds (8896 N). Hold-down connectors shall be provided at the ends of each braced wall panel for the first story to foundation connection with an allowable capacity of 3,900 pounds (17 347 N). In all cases, the hold-down connector force shall be transferred to the foundation.
- 3.4. Cripple walls shall not be permitted.

**2308.11.3 Framing and connection details.** Framing and connection details shall conform to Sections 2308.11.3.1 through 2308.11.3.3.

**2308.11.3.1 Anchorage.** Braced wall lines shall be anchored in accordance with Section 2308.6 at foundations.

**2308.11.3.2 Stepped footings.** Where the height of a required braced wall panel extending from foundation to floor above varies more than 4 feet (1219 mm), the following construction shall be used:

1. Where the bottom of the footing is stepped and the lowest floor framing rests directly on a sill bolted to the footings, the sill shall be anchored as required in Section 2308.3.3.
2. Where the lowest floor framing rests directly on a sill bolted to a footing not less than 8 feet (2438 mm) in length along a line of bracing, the line shall be considered to be braced. The double plate of the cripple stud wall beyond the segment of footing extending to the lowest framed floor shall be spliced to the sill plate with metal ties, one on each side of the sill and plate. The metal ties shall not be less than 0.058 inch [1.47 mm (16 galvanized gage)] by 1½ inches (38 mm) wide by 48 inches (1219 mm) with eight 16d common nails on each side of the splice location (see Figure 2308.11.3.2). The metal tie shall have a minimum yield of 33,000 pounds per square inch (psi) (227 MPa). Where cripple walls occur between the top of the footing and the lowest floor framing, the bracing requirements for a story shall apply.

**2308.11.3.3 Openings in horizontal diaphragms.**

Openings in horizontal diaphragms with a dimension perpendicular to the joist that is greater than 4 feet (1219 mm) shall be constructed in accordance with the following:

1. Blocking shall be provided beyond headers.
2. Metal ties not less than 0.058 inch [1.47 mm (16 galvanized gage)] by 1½ inches (38 mm) wide with eight 16d common nails on each side of the header-joist intersection shall be provided (see Figure 2308.11.3.3). The metal ties shall have a minimum yield of 33,000 psi (227 MPa).

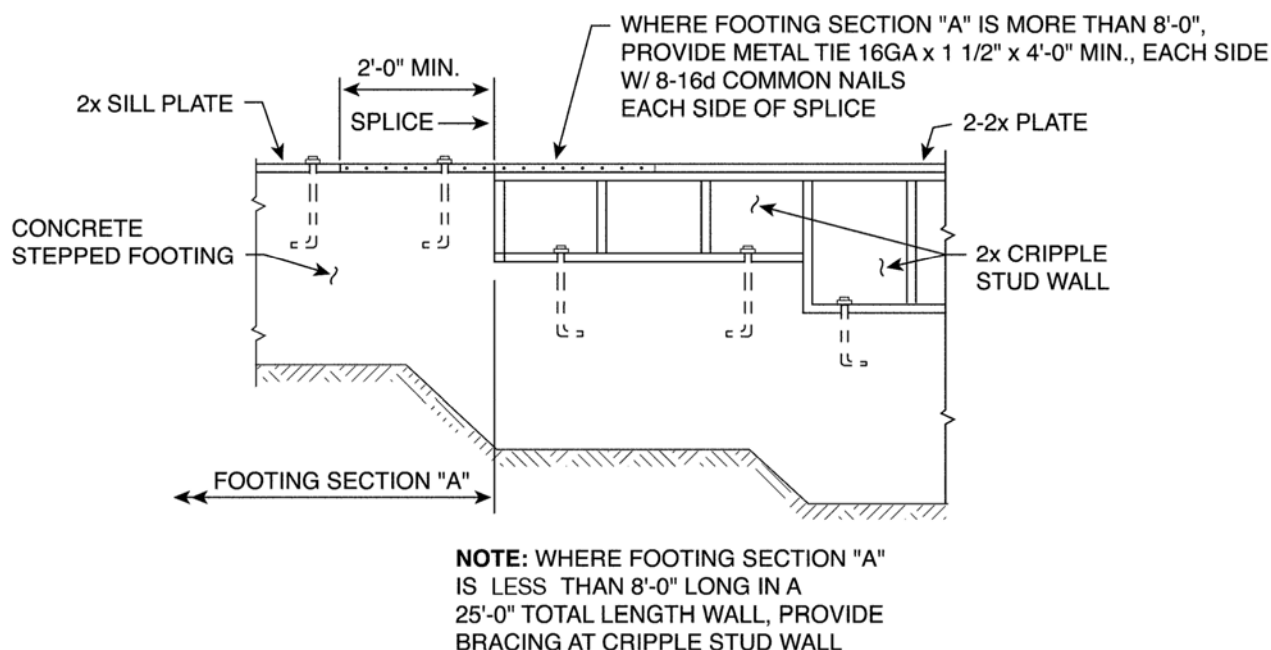
**2308.12 Additional requirements for conventional construction in Seismic Design Category D.** Structures of conventional light-frame construction in Seismic Design Category D as determined in Section 1613, shall conform to Sections 2308.12.1 through 2308.12.8, in addition to the requirements for Seismic Design Category B or C in Section 2308.11.

**2308.12.1 Number of stories.** Structures of conventional light-frame construction shall not exceed one story above grade plane in Seismic Design Category D.

**2308.12.2 Concrete or masonry.** Concrete or masonry walls and stone or masonry veneer shall not extend above a basement.

**Exception:** Stone and masonry veneer is permitted to be used in the first story above grade plane in Seismic Design Category D, provided the following criteria are met:

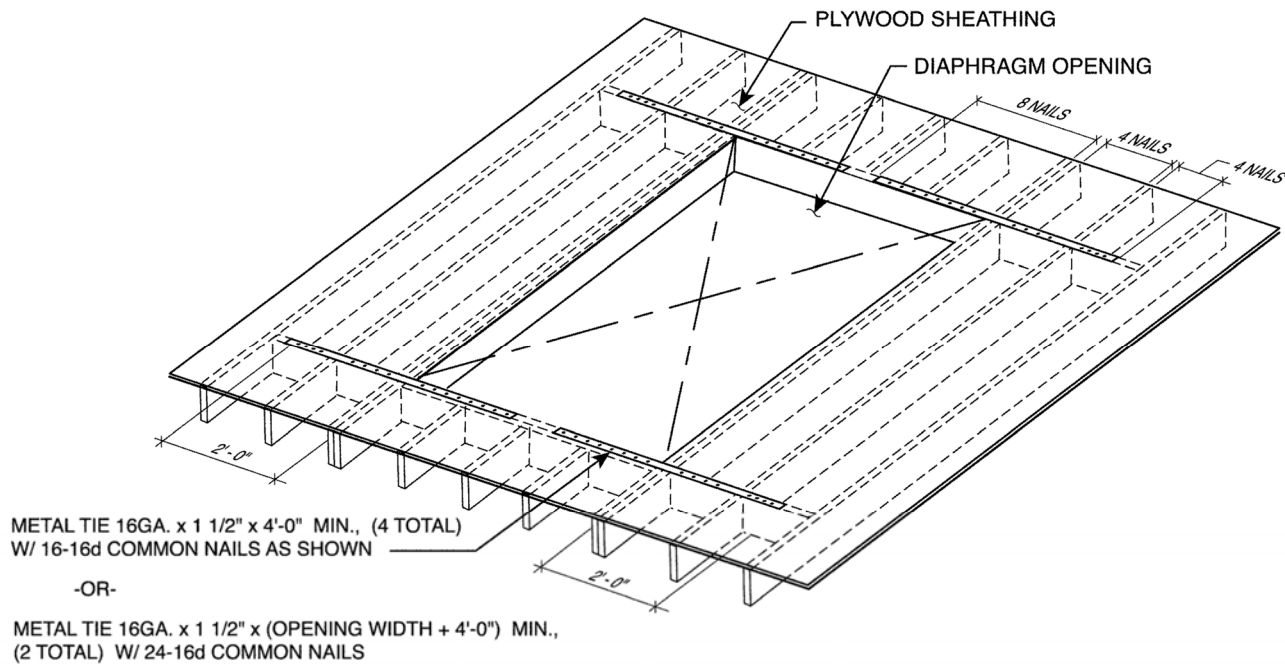
1. Type of brace in accordance with Section 2308.9.3 shall be Method 3 and the allowable shear capacity in accordance with Table 2306.3 shall be a minimum of 350 plf (5108 N/m).



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

**FIGURE 2308.11.3.2**  
**STEPPED FOOTING CONNECTION DETAILS**





For SI: 1 inch = 25.4 mm. 1 foot = 304.8 mm.

**FIGURE 2308.11.3.3**  
**OPENINGS IN HORIZONTAL DIAPHRAGMS**

2. The bracing of the first story shall be located at each end and at least every 25 feet (7620 mm) o.c. but not less than 45 percent of the braced wall line.
3. Hold-down connectors shall be provided at the ends of braced walls for the first floor to foundation with an allowable capacity of 2,100 pounds (9341 N).
4. Cripple walls shall not be permitted.

**2308.12.3 Braced wall line spacing.** Spacing between interior and exterior braced wall lines shall not exceed 25 feet (7620 mm).

**2308.12.4 Braced wall line sheathing.** Braced wall lines shall be braced by one of the types of sheathing prescribed by Table 2308.12.4 as shown in Figure 2308.9.3. The sum of lengths of braced wall panels at each braced wall line shall conform to Table 2308.12.4. Braced wall panels shall be distributed along the length of the braced wall line and start at not more than 8 feet (2438 mm) from each end of the braced wall line. Panel sheathing joints shall occur over studs or blocking. Sheathing shall be fastened to studs and top and bottom plates and at panel edges occurring over blocking. Wall framing to which sheathing used for bracing is applied shall be nominal 2 inch wide [actual 1½ inch (38 mm)] or larger members. Cripple walls having a stud height exceeding 14 inches (356 mm) shall be considered a story for the purpose of this section and shall be braced as required for braced wall lines in accordance with Table 2308.12.4. Where interior

braced wall lines occur without a continuous foundation below, the length of parallel exterior cripple wall bracing shall be one and one-half times the lengths required by Table 2308.12.4. Where the cripple wall sheathing type used is Type S-W and this additional length of bracing cannot be provided, the capacity of Type S-W sheathing shall be increased by reducing the spacing of fasteners along the perimeter of each piece of sheathing to 4 inches (102 mm) o.c.

**2308.12.5 Attachment of sheathing.** Fastening of braced wall panel sheathing shall not be less than that prescribed in Table 2308.12.4 or 2304.9.1. Wall sheathing shall not be attached to framing members by adhesives.

**2308.12.6 Irregular structures.** Conventional light-frame construction shall not be used in irregular portions of structures in Seismic Design Category D. Such irregular portions of structures shall be designed to resist the forces specified in Chapter 16 to the extent such irregular features affect the performance of the conventional framing system. A portion of a structure shall be considered to be irregular where one or more of the conditions described in Items 1 through 6 below are present.

1. Where exterior braced wall panels are not in one plane vertically from the foundation to the uppermost story in which they are required, the structure shall be considered to be irregular (see Figure 2308.12.6(1)).

**Exception:** Floors with cantilevers or setbacks not exceeding four times the nominal depth of the

**TABLE 2308.12.4**  
**WALL BRACING IN SEISMIC DESIGN CATEGORIES D AND E**  
**(Minimum Length of Wall Bracing per each 25 Linear Feet of Braced Wall Line<sup>a</sup>)**

CONDITION	SHEATHING TYPE <sup>b</sup>	$S_{DS} < 0.50$	$0.50 \leq S_{DS} < 0.75$	$0.75 \leq S_{DS} \leq 1.00$	$S_{DS} > 1.00$
One story	G-P <sup>c</sup>	10 feet 8 inches	14 feet 8 inches	18 feet 8 inches	25 feet 0 inches
	S-W	5 feet 4 inches	8 feet 0 inches	9 feet 4 inches	12 feet 0 inches

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Minimum length of panel bracing of one face of the wall for S-W sheathing or both faces of the wall for G-P sheathing; h/w ratio shall not exceed 2:1. For S-W panel bracing of the same material on two faces of the wall, the minimum length is permitted to be one-half the tabulated value but the h/w ratio shall not exceed 2:1 and design for uplift is required.
- b. G-P = gypsum board, fiberboard, particleboard, lath and plaster or gypsum sheathing boards; S-W = wood structural panels and diagonal wood sheathing.
- c. Nailing as specified below shall occur at all panel edges at studs, at top and bottom plates and, where occurring, at blocking:
- For  $\frac{1}{2}$ -inch gypsum board, 5d (0.113 inch diameter) cooler nails at 7 inches on center;
- For  $\frac{5}{8}$ -inch gypsum board, No. 11 gage (0.120 inch diameter) at 7 inches on center;
- For gypsum sheathing board,  $1\frac{3}{4}$  inches long by  $\frac{7}{16}$ -inch head, diamond point galvanized nails at 4 inches on center;
- For gypsum lath, No. 13 gage (0.092 inch) by  $1\frac{1}{8}$  inches long,  $\frac{19}{64}$ -inch head, plasterboard at 5 inches on center;
- For Portland cement plaster, No. 11 gage (0.120 inch) by  $1\frac{1}{2}$  inches long,  $\frac{7}{16}$ -inch head at 6 inches on center;
- For fiberboard and particleboard, No. 11 gage (0.120 inch) by  $1\frac{1}{2}$  inches long,  $\frac{7}{16}$ -inch head, galvanized nails at 3 inches on center.

floor joists (see Figure 2308.12.6(2)) are permitted to support braced wall panels provided:

1. Floor joists are 2 inches by 10 inches (51 mm by 254 mm) or larger and spaced not more than 16 inches (406 mm) o.c.
  2. The ratio of the back span to the cantilever is at least 2:1.
  3. Floor joists at ends of braced wall panels are doubled.
  4. A continuous rim joist is connected to the ends of cantilevered joists. The rim joist is permitted to be spliced using a metal tie not less than 0.058 inch (1.47 mm) (16 galvanized gage) and  $1\frac{1}{2}$  inches (38 mm) wide fastened with six 16d common nails on each side. The metal tie shall have a minimum yield of 33,000 psi (227 Mpa).
  5. Joists at setbacks or the end of cantilevered joists shall not carry gravity loads from more than a single story having uniform wall and roof loads, nor carry the reactions from headers having a span of 8 feet (2438 mm) or more.
2. Where a section of floor or roof is not laterally supported by braced wall lines on all edges, the structure shall be considered to be irregular (see Figure 2308.12.6(3)).
- Exception:** Portions of roofs or floors that do not support braced wall panels above are permitted to extend up to 6 feet (1829 mm) beyond a braced wall line (see Figure 2308.12.6(4)).
3. Where the end of a required braced wall panel extends more than 1 foot (305mm) over an opening in the wall below, the structure shall be considered to be irregular. This requirement is applicable to braced wall panels offset in plane and to braced wall panels offset out of plane as permitted by the exception to Item 1 above in this section (see Figure 2308.12.6(5)).

**Exception:** Braced wall panels are permitted to extend over an opening not more than 8 feet (2438 mm) in width where the header is a 4-inch by 12-inch (102 mm by 305 mm) or larger member.

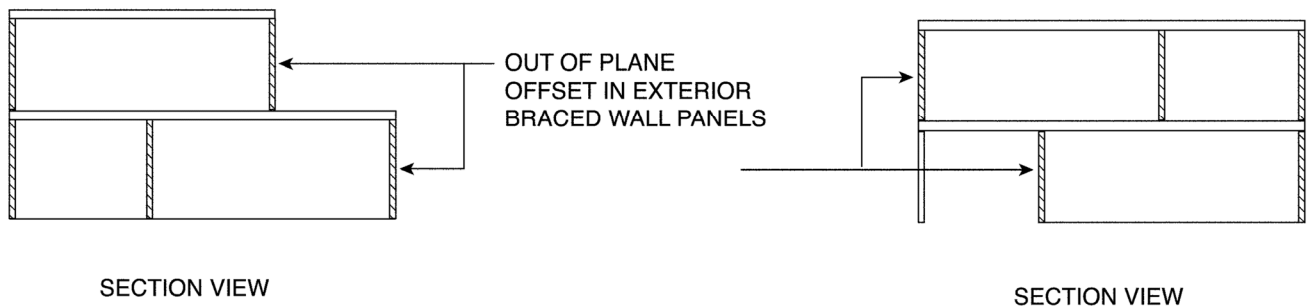
4. Where portions of a floor level are vertically offset such that the framing members on either side of the offset cannot be lapped or tied together in an approved manner, the structure shall be considered to be irregular (see Figure 2308.12.6(6)).

**Exception:** Framing supported directly by foundations need not be lapped or tied together.

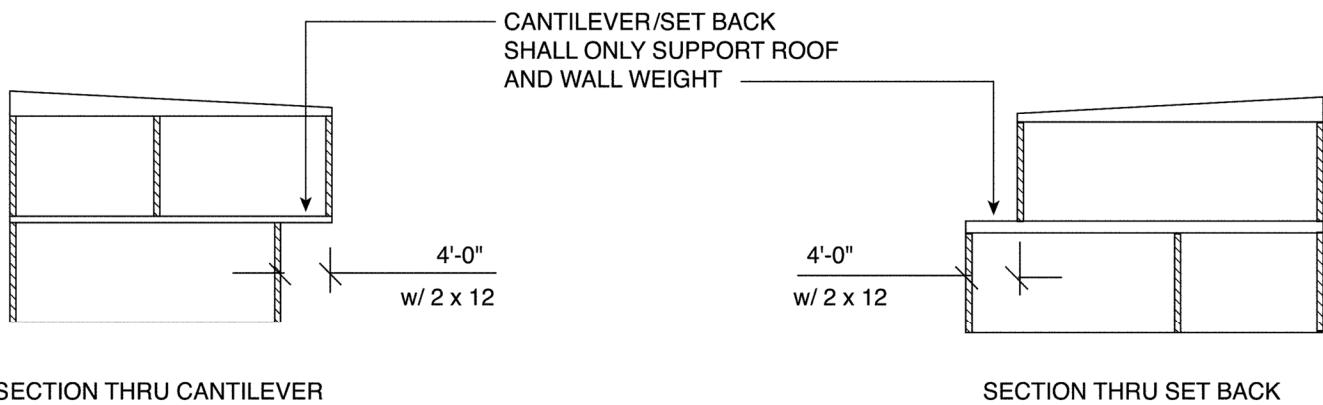
5. Where braced wall lines are not perpendicular to each other, the structure shall be considered to be irregular (see Figure 2308.12.6(7)).
6. Where openings in floor and roof diaphragms having a maximum dimension greater than 50 percent of the distance between lines of bracing or an area greater than 25 percent of the area between orthogonal pairs of braced wall lines are present, the structure shall be considered to be irregular (see Figure 2308.12.6(8)).

**2308.12.7 Anchorage of exterior means of egress components.** Exterior egress balconies, exterior exit stairways and similar means of egress components shall be positively anchored to the primary structure at not over 8 feet (2438 mm) o.c. or shall be designed for lateral forces. Such attachment shall not be accomplished by use of toenails or nails subject to withdrawal.

**2308.12.8 Sill plate anchorage.** Sill plates shall be anchored with anchor bolts with steel plate washers between the foundation sill plate and the nut, or approved anchor straps load rated in accordance with Section 1716.1. Such washers shall be a minimum of 0.229 inch by 3 inches by 3 inches (5.82 mm by 76 mm by 76 mm) in size. The hole in the plate washer is permitted to be diagonally slotted with a width of up to  $\frac{3}{16}$  inch (4.76 mm) larger than the bolt diameter and a slot length not to exceed  $1\frac{3}{4}$  inches (44 mm), provided a standard cut washer is placed between the plate washer and the nut.

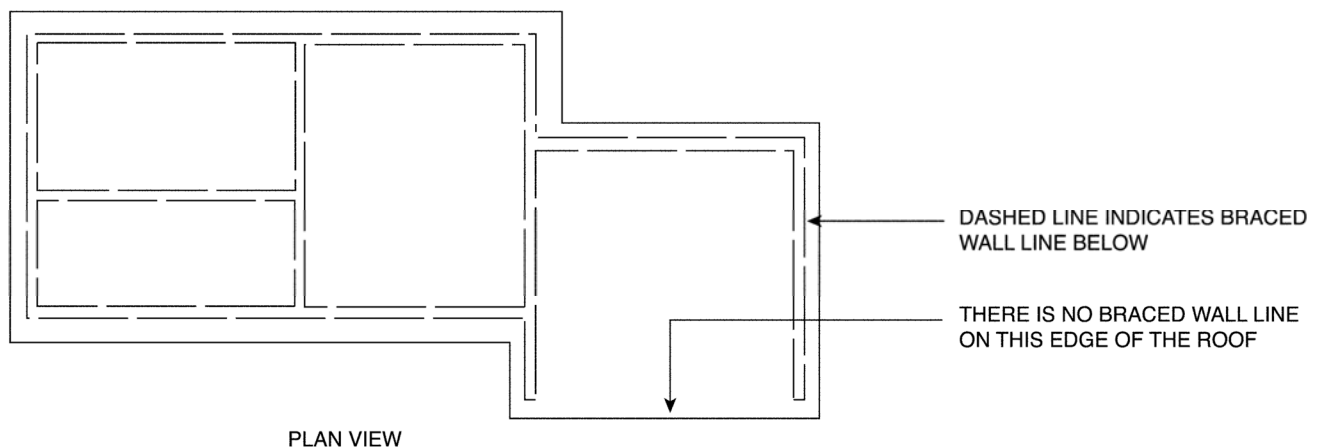


**FIGURE 2308.12.6(1)**  
**BRACED WALL PANELS OUT OF PLANE**

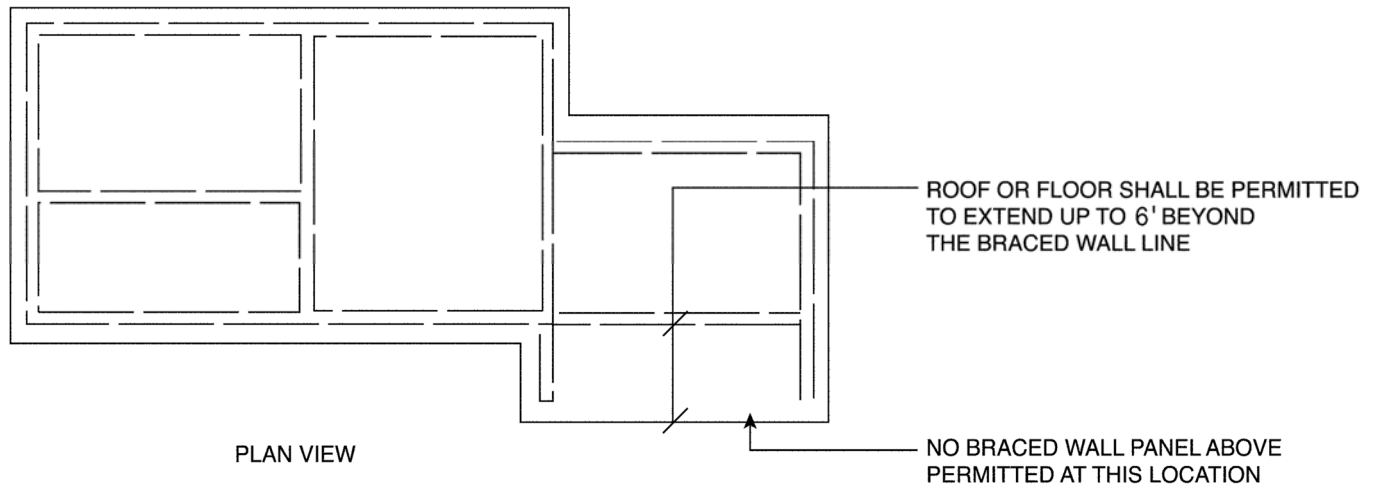


For SI: 1 foot = 304.8 mm.

**FIGURE 2308.12.6(2)**  
**BRACED WALL PANELS SUPPORTED BY CANTILEVER OR SET BACK**

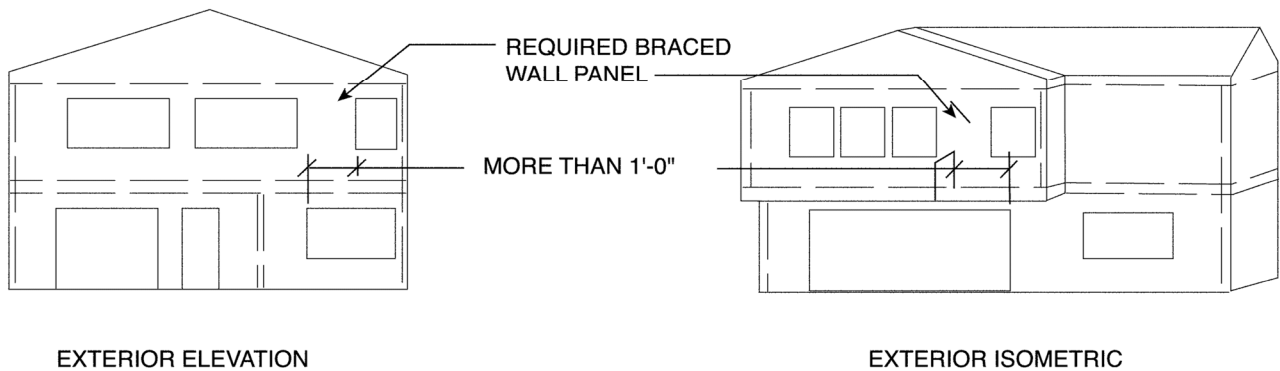


**FIGURE 2308.12.6(3)**  
**FLOOR OR ROOF NOT SUPPORTED ON ALL EDGES**



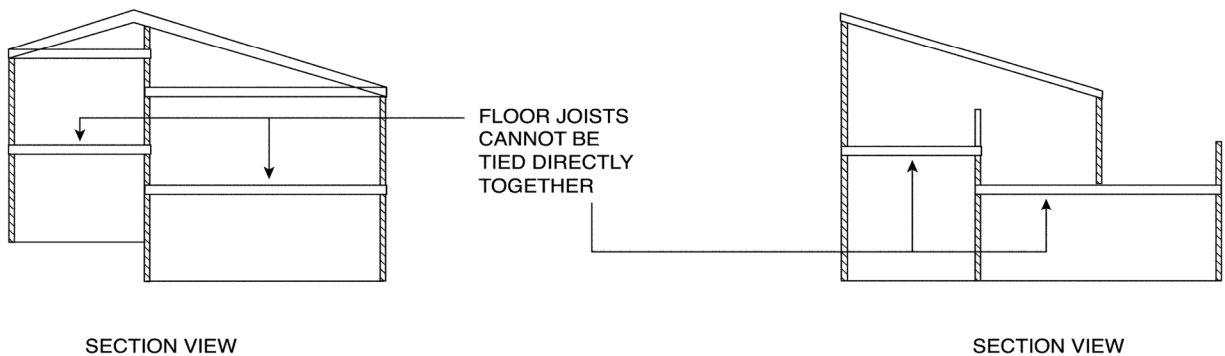
For SI: 1 foot = 304.8 mm.

**FIGURE 2308.12.6(4)**  
**ROOF OR FLOOR EXTENSION BEYOND BRACED WALL LINE**



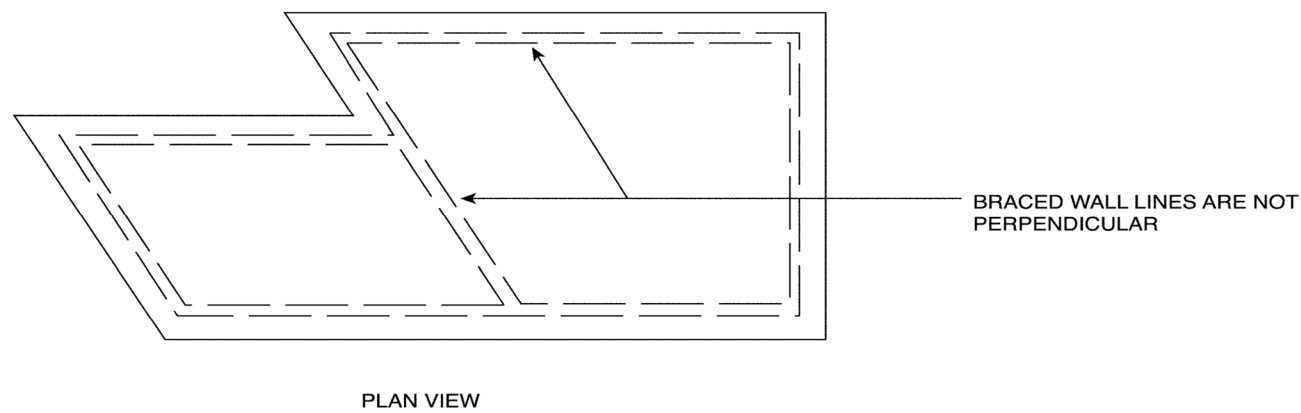
For SI: 1 foot = 304.8 mm.

**FIGURE 2308.12.6(5)**  
**BRACED WALL PANEL EXTENSION OVER OPENING**

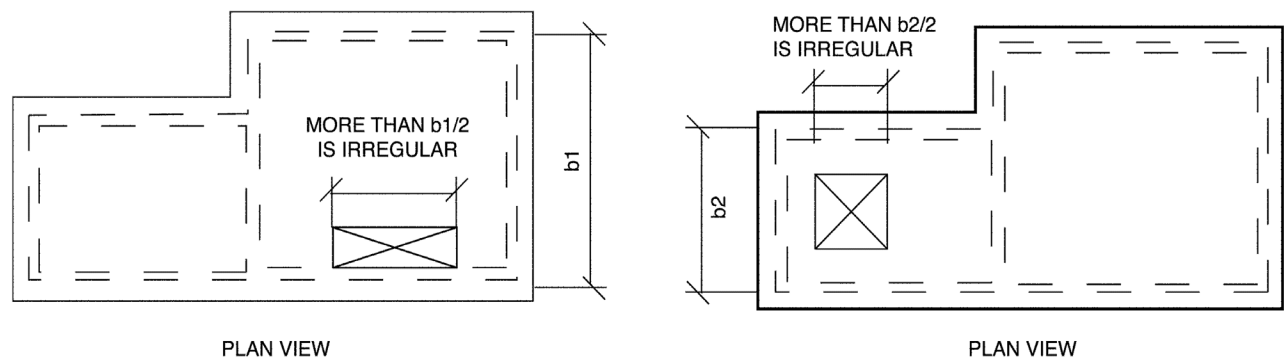


**FIGURE 2308.12.6(6)**  
**PORTIONS OF FLOOR LEVEL OFFSET VERTICALLY**





**FIGURE 2308.12.6(7)**  
**BRACED WALL LINES NOT PERPENDICULAR**



**FIGURE 2308.12.6(8)**  
**OPENING LIMITATIONS FOR FLOOR AND ROOF DIAPHRAGMS**

## CHAPTER 24

# GLASS AND GLAZING

### SECTION BC 2401 GENERAL

**2401.1 Scope.** The provisions of this chapter shall govern the materials, design, construction and quality of glass, light transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures.

**2401.2 Glazing replacement.** The installation of replacement glass shall be as required for new installations. See Sections 28-101.4.1, 28-101.4.2, 28-101.4.3 and 28-101.4.4 of the *Administrative Code* for requirements relating to prior code buildings.

### SECTION BC 2402 DEFINITIONS

**2402.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**DALLE GLASS.** A decorative composite glazing material made of individual pieces of glass that are embedded in a cast matrix of concrete or epoxy.

**DECORATIVE GLASS.** A carved, leaded or Dalle glass or glazing material whose purpose is decorative or artistic, not functional; whose coloring, texture or other design qualities or components cannot be removed without destroying the glazing material and whose surface, or assembly into which it is incorporated, is divided into segments.

**HOISTWAY.** The hoistway is the opening through a building or structure for the travel of elevators, dumbwaiters, or material lifts, extending from the pit floor to the roof or floor above.

### SECTION BC 2403 GENERAL REQUIREMENTS FOR GLASS

**2403.1 Identification.** Each pane shall bear the manufacturer's label designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.3.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification label shall be acid etched, sand blasted, ceramic fired, laser etched embossed or shall be of a type that once applied cannot be removed without being destroyed. Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

**2403.2 Glass supports.** Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, or as requested by the applicant, detailed construction documents, detailed shop drawings and analysis or test data assuring safe performance for the specific installation shall be prepared by an architect or engineer.

**2403.3 Framing.** To be considered firmly supported, the framing members for each individual pane of glass shall be designed so the deflection of the edge of the glass perpendicular to the glass pane shall not exceed  $\frac{1}{175}$  of the glass edge length or  $\frac{3}{4}$  inch (19.1 mm), whichever is less, when subjected to the larger of the positive or negative load where loads are combined as specified in Section 1605.

**2403.4 Interior glazed areas.** Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall not be greater than the thickness of the panels when a force of 50 pounds per linear foot (plf) (730 N/m) is applied horizontally to one panel at any point up to 42 inches (1067 mm) above the walking surface.

**2403.5 Louvered windows or jalousies.** Float, wired and patterned glass in louvered windows and jalousies shall be no thinner than nominal  $\frac{3}{16}$  inch (4.8 mm) and no longer than 48 inches (1219 mm). Exposed glass edges shall be smooth. Wired glass with wire exposed on longitudinal edges shall not be used in louvered windows or jalousies. Where other glass types are used, the design shall be submitted to the department for approval.

### SECTION BC 2404 WIND, SNOW, SEISMIC AND DEAD LOADS ON GLASS

**2404.1 Vertical glass.** Glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain walls and window walls, doors and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding. The load resistance of glass under uniform load shall be determined in accordance with ASTM E 1300. Glass and glazing assemblies shall meet the seismic requirements of ASCE 7.

The design of vertical glazing shall be based on the following equation:

$$F_{gw} \leq F_{ga} \quad \text{(Equation 24-1)}$$

where:

$F_{gw}$  = Wind load on the glass computed in accordance with Section 1609.

$F_{ga}$  = Short duration load on the glass as determined in accordance with ASTM E 1300.

**2404.2 Sloped glass.** Glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunrooms, sloped roofs and other exterior applications shall be designed to resist the most critical of the following combinations of loads.

$$F_g = W_o - D \quad (\text{Equation 24-2})$$

$$F_g = W_i + D + 0.5S \quad (\text{Equation 24-3})$$

$$F_g = 0.5 W_i + D + S \quad (\text{Equation 24-4})$$

where:

**NYC** |  $D$  = Glass dead load (kN/m<sup>2</sup>).

For glass sloped 30 degrees (0.52 rad) or less from horizontal,

$$= 13 t_g \text{ (For SI: } 0.0245 t_g \text{)}$$

For glass sloped more than 30 degrees (0.52 rad) from horizontal,

$$= 13 t_g \cos \theta \text{ (For SI: } 0.0245 t_g \cos \theta \text{)}$$

$F_g$  = Total load, psf (kN/m<sup>2</sup>) on glass.

$S$  = Snow load, psf (kN/m<sup>2</sup>) as determined in Section 1608.

$t_g$  = Total glass thickness, inches (mm) of glass panes and plies.

$W_i$  = Inward wind force, psf (kN/m<sup>2</sup>) as calculated in Section 1609.

$W_o$  = Outward wind force, psf (kN/m<sup>2</sup>) as calculated in Section 1609.

$\theta$  = Angle of slope from horizontal.

**Exception:** Unit skylights shall be designed in accordance with Section 2405.5.

The design of sloped glazing shall be based on the following equation:

$$F_g \leq F_{ga} \quad (\text{Equation 24-5})$$

where:

$F_g$  = Total load on the glass determined from the load combinations above.

$F_{ga}$  = Short duration load resistance of the glass as determined according to ASTM E 1300 for Equations 24-2 and 24-3; or the long duration load resistance of the glass as determined according to ASTM E 1300 for Equation 24-4.

### 2404.3 Wired, patterned and sandblasted glass.

**2404.3.1 Vertical wired glass.** Wired glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to the following equation:

$$F_{gw} < 0.5 F_{ge} \quad (\text{Equation 24-6})$$

where:

$F_{gw}$  = Is the wind load on the glass computed per Section 1609.

$F_{ge}$  = Nonfactored load from ASTM E 1300 using a thickness designation for monolithic glass that is not greater than the thickness of wired glass.

**2404.3.2 Sloped wired glass.** Wired glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunspaces, sloped roofs and other exterior applications shall be designed to resist the most critical of the combinations of loads from Section 2404.2.

For Equations 24-2 and 24-3:

$$F_g < 0.5 F_{ge} \quad (\text{Equation 24-7})$$

For Equation 24-4:

$$F_g < 0.3 F_{ge} \quad (\text{Equation 24-8})$$

where:

$F_g$  = Total load on the glass.

$F_{ge}$  = Nonfactored load from ASTM E 1300.

**2404.3.3 Vertical patterned glass.** Patterned glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to the following equation:

$$F_{gw} < 1.0 F_{ge} \quad (\text{Equation 24-9})$$

where:

$F_{gw}$  = Wind load on the glass computed per Section 1609.

$F_{ge}$  = Nonfactored load from ASTM E 1300. The value for patterned glass shall be based on the thinnest part of the glass. Interpolation between nonfactored load charts in ASTM E 1300 shall be permitted.

**2404.3.4 Sloped patterned glass.** Patterned glass sloped more than 15 degrees (0.26 rad) from vertical in skylights, sunspaces, sloped roofs and other exterior applications shall be designed to resist the most critical of the combinations of loads from Section 2404.2.

For Equations 24-2 and 24-3:

$$F_g < 1.0 F_{ge} \quad (\text{Equation 24-10})$$

For Equation 24-4:

$$F_g < 0.6 F_{ge} \quad (\text{Equation 24-11})$$

Where

$F_g$  = Total load on the glass.

$F_{ge}$  = Nonfactored load from ASTM E 1300. The value for patterned glass shall be based on the thinnest part of the glass. Interpolation between the nonfactored load charts in ASTM E 1300 shall be permitted.

**2404.3.5 Vertical sandblasted glass.** Sandblasted glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors, and other exterior applications shall be designed to resist the wind loads in Section 1609 for components and cladding according to the following equation:

$$F_g < 0.5 F_{ge} \quad (\text{Equation 24-12})$$

where:

$F_g$  = Total load on the glass.

$F_{ge}$  = Nonfactored‡ load from ASTM E 1300. The value for sandblasted glass is for moderate levels of sandblasting.

**2404.4 Other designs.** For designs outside the scope of this section, an analysis or test data for the specific installation shall be prepared by a registered design professional.

## SECTION BC 2405 SLOPED GLAZING AND SKYLIGHTS

**2405.1 Scope.** This section applies to the installation of glass and other transparent, translucent or opaque glazing material installed at a slope more than 15 degrees (0.26 rad) from the vertical plane, including glazing materials in skylights, roofs and sloped walls.

**2405.1.1 Glass in walking surfaces.** Glass installed in the walking surface of floors, landings, stairs and similar locations shall be designed and engineered by a registered design professional and the design shall include the applicable provisions of ASTM E 2751.

**2405.2 Allowable glazing materials and limitations.** Sloped glazing shall be any of the following materials, subject to the listed limitations:

1. For monolithic glazing systems, the glazing material of the single light or layer shall be laminated glass with a minimum 30-mil (0.76 mm) polyvinyl butyral (or equivalent) interlayer, wired glass, light-transmitting plastic materials meeting the requirements of Section 2607, heat-strengthened glass or fully tempered glass.
2. For multiple-layer glazing systems, each light or layer shall consist of any of the glazing materials specified in Item 1 above. Annealed glass is permitted to be used as specified within Exceptions 2 and 3 of Section 2405.3. For additional requirements for plastic skylights, see Section 2610. Glass-block construction shall conform to the requirements of Section 2101.2.5.

**2405.3 Screening.** Where used in monolithic glazing systems, heat-strengthened glass and fully tempered glass shall have screens installed below the glazing material. The screens and their fastenings shall: (1) be capable of supporting twice the weight of the glazing; (2) be firmly and substantially fastened to the framing members and (3) be installed within 4 inches (102 mm) of the glass. The screens shall be constructed of a noncombustible material not thinner than No. 12 B&S gage (0.0808 inch) with mesh not larger than 1 inch by 1 inch (25 mm by 25 mm). In a corrosive atmosphere, structurally equivalent noncorrosive screen materials shall be used. Heat-strengthened glass, fully tempered glass and wired glass, when used in multiple-layer glazing systems as the bottom glass layer over the walking surface, shall be equipped with screening that conforms to the requirements for monolithic glazing systems.

**Exception:** In monolithic and multiple-layer sloped glazing systems, the following applies:

1. Fully tempered glass installed without protective screens where glazed between intervening floors at a

slope of 30 degrees (0.52 rad) or less from the vertical plane shall have the highest point of the glass 10 feet (3048 mm) or less above the walking surface.

2. Screens are not required below any glazing material, including annealed glass, where the walking surface below the glazing material is permanently protected from the risk of falling glass or the area below the glazing material is not a walking surface.
3. Any glazing material, including annealed glass, is permitted to be installed without screens in the sloped glazing systems of commercial or detached noncombustible greenhouses used exclusively for growing plants and not open to the public, provided that the height of the greenhouse at the ridge does not exceed 30 feet (9144 mm) above grade.

4. Screens shall not be required within individual dwelling units in Groups R-2 and R-3 where fully tempered glass is used as single glazing or as both panes in an insulating glass unit, and the following conditions are met:

4.1. Each pane of the glass is 16 square feet (1.5 m<sup>2</sup>) or less in area.

4.2. The highest point of the glass is 12 feet (3658 mm) or less above any walking surface or other accessible area.

4.3. The glass thickness is  $\frac{3}{16}$  inch (4.8 mm) or less.

5. Screens shall not be required for laminated glass with a 15-mil (0.38 mm) polyvinyl butyral (or equivalent) interlayer used within individual dwelling units in Groups R-2 and R-3 within the following limits:

5.1. Each pane of glass is 16 square feet (1.5 m<sup>2</sup>) or less in area.

5.2. The highest point of the glass is 12 feet (3658 mm) or less above a walking surface or other accessible area.

**2405.4 Framing.** In Type I and II construction, sloped glazing and skylight frames shall be constructed of noncombustible materials. In structures where acid fumes deleterious to metal are incidental to the use of the buildings, approved pressure-treated wood or other approved noncorrosive materials are permitted to be used for sash and frames. Framing supporting sloped glazing and skylights shall be designed to resist the tributary roof loads in Chapter 16. Skylights set at an angle of less than 45 degrees (0.79 rad) from the horizontal plane shall be mounted at least 4 inches (102 mm) above the plane of the roof on a curb constructed as required for the frame. Skylights shall not be installed in the plane of the roof where the roof pitch is less than 45 degrees (0.79 rad) from the horizontal.

**Exception:** Installation of a skylight without a curb shall be permitted on roofs with a minimum slope of 14 degrees (three units vertical in 12 units horizontal) in Group R-3 occupancies. All unit skylights installed in a roof with a pitch flatter than 14 degrees (0.24 rad) shall be mounted at least 4 inches (102 mm) above the plane of



the roof on a curb constructed as required for the frame unless otherwise specified in the manufacturer's installation instructions.

**2405.5 Unit skylights.** Unit skylights shall be tested and labeled as complying with AAMA/WDMA/CSA 101/I.S.2/A440 Voluntary Performance Specification for Windows, Skylights and Glass. The label shall state the name of the manufacturer, the approved agency, the product designation and the performance grade rating as specified in AAMA/WDMA/CSA 101/I.S.2/A440. If the product manufacturer has chosen to have the performance grade of the skylight rated separately for positive and negative design pressure, then the label shall state both performance grade ratings as specified in AAMA/WDMA/CSA 101/I.S.2/A440 and the skylight shall comply with Section 2405.5.2. If the skylight is not rated separately for positive and negative pressure, then the performance grade rating shown on the label shall be the performance grade rating determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 for both positive and negative design pressure, and the skylight shall conform to Section 2405.5.1.

**2405.5.1 Unit skylights rated for the same performance grade for both positive and negative design pressure.** The design of unit skylights shall be based on the following equation:

$$F_g \leq PG \quad (\text{Equation 24-13})$$

where:

$F_g$  = Maximum load on the skylight determined from Equations 24-2 through 24-4 in Section 2404.2.

$PG$  = Performance grade rating of the skylight.

**2405.5.2 Unit skylights rated for separate performance grades for positive and negative design pressure.** The design of unit skylights rated for performance grade for both positive and negative design pressures shall be based on the following equations:

$$F_{gi} \leq PG_{Pos} \quad (\text{Equation 24-14})$$

$$F_{go} \leq PG_{Neg} \quad (\text{Equation 24-15})$$

where:

$PG_{Pos}$  = Performance grade rating of the skylight under positive design pressure,

$PG_{Neg}$  = Performance grade rating of the skylight under negative design pressure, and

$F_{gi}$  and  $F_{go}$  are determined in accordance with the following:

For  $W_o < D$ ,

where:

$W_o$  = Outward wind force, psf (kN/m<sup>2</sup>) as calculated in Section 1609.

$D$  = The dead weight of the glazing, psf (kN/m<sup>2</sup>) as determined in Section 2404.2 for glass, or by the weight of the plastic, psf (kN/m<sup>2</sup>) for plastic glazing.

$F_{gi}$  = Maximum load on the skylight determined from Equations 24-3 and 24-4 in Section 2404.2.

$F_{go}$  = Maximum load on the skylight determined from Equation 24-2.

For  $W_o < D$ ,

where:

$W_o$  = Outward wind force, psf (kN/m<sup>2</sup>) as calculated in Section 1609.

$D$  = The dead weight of the glazing, psf (kN/m<sup>2</sup>) as determined in Section 2404.2 for glass, or by the weight of the plastic for plastic glazing.

$F_{gi}$  = Maximum load on the skylight determined from Equations 24-2 through 24-4 in Section 2404.2.

$F_{go} = 0$ .

## SECTION BC 2406 SAFETY GLAZING

**2406.1 Human impact loads.** Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 2406.4 shall comply with Sections 2406.1.1 through 2406.1.4.

**2406.1.1 Impact test.** Except as provided in Sections 2406.1.2 through 2406.1.4, all glazing shall pass the impact test requirements Section 2406.2.

**2406.1.2 Plastic glazing.** Plastic glazing shall meet the weathering requirements of ANSI Z97.1.

**2406.1.3 Glass block.** Glass-block walls shall comply with Section 2101.2.5.

**2406.1.4 Louvered windows and jalousies.** Louvered windows and jalousies shall comply with Section 2403.5.

**2406.2 Impact test.** Where required by other sections of this code, glazing shall be tested in accordance with CPSC 16 CFR 1201. Glazing shall comply with the test criteria for Category I or II as indicated in Table 2406.2(1).

**Exception:** Glazing not being used for doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers shall be permitted to be tested in accordance with ANSI Z97.1. Glazing shall comply with the test criteria for Class A or B as indicated in Table 2406.2(2).

**2406.3 Identification of safety glazing.** Except as indicated in Section 2406.3.1, each pane of safety glazing installed in hazardous locations shall be identified by a label specifying the labeler, whether the manufacturer or installer, and the safety glazing standard with which it complies, as well as the information specified in Section 2403.1. A label as defined in Section 202 and meeting the requirements of this section shall be permitted in lieu of the manufacturer's designation.

### Exceptions:

- For other than tempered glass, labels are not required, provided the department approves the use of a certificate, affidavit or other evidence confirming compliance with this code.

**TABLE 2406.2(1)**  
**MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING CPSC 16 CFR 1201**

EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE	GLAZING IN STORM OR COMBINATION DOORS (Category class)	GLAZING IN DOORS (Category class)	GLAZED PANELS REGULATED BY ITEM 7 OF SECTION 2406.4 (Category class)	GLAZED PANELS REGULATED BY ITEM 6 OF SECTION 2406.4 (Category class)	DOORS AND ENCLOSURES REGULATED BY ITEM 5 OF SECTION 2406.4 (Category class)	SLIDING GLASS DOORS PATIO TYPE (Category class)
9 square feet or less	I	I	No requirement	I	II	II
More than 9 square feet	II	II	II	II	II	II

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

**TABLE 2406.2(2)**  
**MINIMUM CATEGORY CLASSIFICATION OF GLAZING USING ANSI Z97.1**

EXPOSED SURFACE AREA OF ONE SIDE OF ONE LITE	GLAZED PANELS REGULATED BY ITEM 7 OF SECTION 2406.4 (Category class)	GLAZED PANELS REGULATED BY ITEM 6 OF SECTION 2406.4 (Category class)	DOORS AND ENCLOSURES REGULATED BY ITEM 5 OF SECTION 2406.4 <sup>a</sup> (Category class)
9 square feet or less	No requirement	B	A
More than 9 square feet	A	A	A

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

a. Use is only permitted by the exception to Section 2406.2.

2. Tempered spandrel glass is permitted to be identified by the manufacturer with a removable paper label.

2. Where access through the door is to a closet or storage area 3 feet (914 mm) or less in depth. Glazing in this application shall comply with Section 2406.4, Item 7.

3. Glazing in walls perpendicular to the plane of the door in a closed position, other than the wall towards which the door swings when opened in one- and two-family dwellings or within dwelling units in Group R-2.

7. Glazing in an individual fixed or operable panel, other than in those locations described in preceding Items 5 and 6, which meets all of the following conditions:

- 7.1. Exposed area of an individual pane greater than 9 square feet (0.84 m<sup>2</sup>);
- 7.2. Exposed bottom edge less than 18 inches (457 mm) above the floor;
- 7.3. Exposed top edge greater than 36 inches (914 mm) above the floor; and
- 7.4. One or more walking surface(s) within 36 inches (914 mm) horizontally of the plane of the glazing.

**Exception:** Safety glazing for Item 7 is not required for the following installations:

1. A horizontal protective bar 1½ inches (38 mm) or more in height, capable of withstanding a horizontal load of 50 pounds plf (730 N/m) without contacting the glass, is installed on the accessible sides of the glazing 34 inches to 38 inches (864 mm to 965 mm) above the floor.
2. The outboard pane in insulating glass units or multiple glazing where the bottom exposed edge of the glass is 25 feet (7620 mm) or more above any grade, roof, walking surface or other horizontal or sloped (within 45 degrees of horizontal) (0.78 rad) surface adjacent to the glass exterior.

**2406.4 Hazardous locations.** The following shall be considered specific hazardous locations requiring safety glazing materials:

1. Glazing in swinging doors except jalousies (see Section 2406.4.1).
2. Glazing in fixed and sliding panels of sliding door assemblies and panels in sliding and bifold closet door assemblies.
3. Glazing in storm doors.
4. Glazing in unframed swinging doors.
5. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above a standing surface.
6. Glazing in an individual fixed or operable panel adjacent to a door where the nearest exposed edge of the glazing is within a 24-inch (610 mm) arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the walking surface.

**Exceptions:**

1. Panels where there is an intervening wall or other permanent barrier between the door and glazing.

8. Glazing in guards and railings, including structural baluster panels and nonstructural in-fill panels, regardless of area or height above a walking surface.
9. Glazing in walls and fences enclosing indoor and outdoor swimming pools, hot tubs and spas where all of the following conditions are present:
  - 9.1. The bottom edge of the glazing on the pool or spa side is less than 60 inches (1524 mm) above a walking surface on the pool or spa side of the glazing; and
  - 9.2. The glazing is within 60 inches (1524 mm) horizontally of the water's edge of a swimming pool or spa.
10. Glazing adjacent to stairways, landings and ramps within 36 inches (914 mm) horizontally of a walking surface; when the exposed surface of the glass is less than 60 inches (1524 mm) above the plane of the adjacent walking surface.
11. Glazing adjacent to stairways within 60 inches (1524 mm) horizontally of the bottom tread of a stairway in any direction when the exposed surface of the glass is less than 60 inches (1524 mm) above the nose of the tread.

**Exception:** Safety glazing for Item 10 or 11 is not required for the following installations where:

1. The side of a stairway, landing or ramp which has a guard or handrail, including balusters or in-fill panels, complying with the provisions of Sections 1013 and 1607.7; and
2. The plane of the glass is greater than 18 inches (457 mm) from the railing.

**2406.4.1 Exceptions:** The following products, materials and uses shall not be considered specific hazardous locations:

1. Openings in doors through which a 3-inch (76 mm) sphere is unable to pass.
2. Decorative glass in Section 2406.4, Item 1, 6 or 7.
3. Glazing materials used as curved glazed panels in revolving doors.
4. Commercial refrigerated cabinet glazed doors.
5. Glass-block panels complying with Section 2101.2.5.
6. Louvered windows and jalousies complying with the requirements of Section 2403.5.
7. Mirrors and other glass panels mounted or hung on a surface that provides a continuous backing support.

**2406.5 Fire department access panels.** Fire department glass access panels shall be of nonlaminated† tempered glass. For insulating glass units, all panes shall be nonlaminated† tempered glass.

**Exception:** Fire department access panels that are openable and meeting size requirements of Section 903.2.11.1.

## SECTION BC 2407 GLASS IN HANDRAILS AND GUARDS

**2407.1 Materials.** Glass used as structural balustrade panels in railings shall be constructed of either single fully tempered glass, laminated fully tempered glass or laminated heat-strengthened glass. Glazing in railing in-fill panels shall be of an approved safety glazing material that conforms to the provisions of Section 2406.1.1. For all glazing types, the minimum nominal thickness shall be  $\frac{1}{4}$  inch (6.4 mm). Fully tempered glass and laminated glass shall comply with Category II of CPSC 16 CFR 1201, listed in Chapter 35.

**2407.1.1 Loads.** The panels and their support system shall be designed to withstand the loads specified in Section 1607.7. A safety factor of not less than four shall be used.

**2407.1.2 Support.** Each handrail or guard section shall be supported by a minimum of three glass balusters or shall be otherwise supported to remain in place should one baluster panel fail. Glass balusters shall not be installed without an attached handrail or guard.

**Exception:** A top rail shall not be required where the glass balusters are laminated glass with two or more glass plies of equal thickness and the same glass type when approved by the department. The panels shall be designed to withstand the loads specified in Section 1607.7.

**2407.1.3 Parking garages.** Glazing materials shall not be installed in handrails or guards in parking garages except for pedestrian areas not exposed to impact from vehicles.

**2407.1.4 Glazing in wind-borne debris regions.** Glazing installed in in-fill panels or balusters in wind-borne debris regions shall comply with the following:

**2407.1.4.1 Ballusters and in-fill panels.** Glass installed in exterior railing in-fill panels or balusters shall be laminated glass complying with Category II of CPSC 16 CFR 1201 or Class A of ANSI Z97.1.

**2407.1.4.2 Glass supporting top rail.** When the top rail is supported by glass, the assembly shall be tested according to the impact requirements of Section 1609.1.3. The top rail shall remain in place after impact.

## SECTION BC 2408 GLAZING IN ATHLETIC FACILITIES

**2408.1 General.** Glazing in athletic facilities and similar uses subject to impact loads, which forms whole or partial wall sections or which is used as a door or part of a door, shall comply with this section.

**2408.2 Racquetball and squash courts.**

**2408.2.1 Testing.** Test methods and loads for individual glazed areas in racquetball and squash courts subject to impact loads shall conform to those of CPSC 16 CFR or ANSI Z97.1 listed in Chapter 35, with impacts being applied at a height of 59 inches (1499 mm) above the playing surface to an actual or simulated glass wall instal-

lation with fixtures, fittings and methods of assembly identical to those used in practice.

Glass walls shall comply with the following conditions:

1. A glass wall in a racquetball or squash court, or similar use subject to impact loads, shall remain intact following a test impact.
2. The deflection of such walls shall not be greater than  $1\frac{1}{2}$  inches (38 mm) at the point of impact for a drop height of 48 inches (1219 mm).

Glass doors shall comply with the following conditions:

1. Glass doors shall remain intact following a test impact at the prescribed height in the center of the door.
2. The relative deflection between the edge of a glass door and the adjacent wall shall not exceed the thickness of the wall plus  $\frac{1}{2}$  inch (12.7 mm) for a drop height of 48 inches (1219 mm).

**NYC 2408.3 Gymnasium and basketball courts.** Glazing in multipurpose gymnasiums, basketball courts and similar athletic facilities subject to human impact loads shall comply with Category II of CPSC 16 CFR 1201 or Class A of ANSI Z97.1, listed in Chapter 35.

### SECTION BC $\ddagger$ 2409 GLASS IN ELEVATOR HOISTWAYS AND ELEVATOR CARS

**2409.1 Glass in elevator hoistway enclosures.** Glass in elevator hoistway enclosures and hoistway doors shall be laminated glass conforming to ANSI Z97.1 or CPSC 16 CFR Part 1201 and ASME A17.1, as modified by Appendix K of this code.

**2409.1.1 Fire-resistance-rated hoistways.** Glass installed in hoistways and hoistway doors where the hoistway is required to have a fire-resistance rating shall also comply with Section 715.

**2409.1.2 Glass hoistway doors.** The glass in glass hoistway doors shall be not less than 60 percent of the total visible door panel surface area as seen from the landing side.

**2409.2 Glass vision panels.** Glass in vision panels in elevator hoistway doors shall be permitted to be any transparent glazing material not less than  $\frac{1}{4}$  inches (6.4 mm) in thickness conforming to Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201. The area of any single vision panel shall not be less than 12 square inches (0.008 m<sup>2</sup>), and the total area of one or more vision panels in any hoistway door shall be not more than 40 square inches (0.026 m<sup>2</sup>). See ASME A17.1, as modified by Appendix K of this code for additional requirements.

**2409.3 Glass in elevator cars.**

**2409.3.1 Glass types.** Glass in elevator car enclosures, glass elevator car doors and glass used for lining walls and ceilings of elevator cars shall be laminated glass conforming to Class A in accordance with ANSI Z97.1 or Category

II in accordance with CPSC 16 CFR Part 1201. See ASME A17.1, as modified by Appendix K of this code for additional requirements.

**Exception:** Tempered glass shall be permitted to be used for lining walls and ceilings of elevator cars provided:

1. The glass is bonded to a nonpolymeric coating, sheeting or film backing having a physical integrity to hold the fragments when the glass breaks;
2. The glass is not subjected to further treatment such as sandblasting, etching, heat treatment or painting that could alter the original properties of the glass; and
3. The glass is tested to the acceptance criteria for laminated glass as specified for Class A in accordance with ANSI Z97.1 or Category II in accordance with CPSC 16 CFR Part 1201.

**2409.3.2 Surface area.** The glass in glass elevator car doors shall be not less than 60 percent of the total visible door panel surface area as seen from the car side of the doors.

### SECTION BC 2410 MARKING OF TRANSPARENT DOORS AND FIXED ADJACENT TRANSPARENT SIDELIGHTS

**2410.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**SIDELIGHTS.** Fixed transparent panels which form part of or are immediately adjacent to and within 6 feet $\ddagger$  horizontally of the vertical edge of an opening in which transparent doors are located. A sidelight shall consist of transparent material in which the transparent area above a reference line 18 inches (457 mm) above the adjacent ground, floor or equivalent surface is 80 percent or more of the remaining area of the panel above such reference line.

**TRANSPARENT.** The property of a material which is not opaque and through which objects lying beyond are clearly visible.

**TRANSPARENT DOOR.** A door, manually or power actuated, fabricated of transparent material, in which the transparent area above a reference line 18 inches (457 mm) above the bottom edge of the door is 80 percent or more of the remaining area of the door above such reference line.

**TRANSPARENT SAFETY GLAZING MATERIALS.** Materials which will clearly transmit light and also minimize the possibility of cutting or piercing injuries resulting from breakage of the material. Materials covered by this definition include laminated glass, tempered glass (also known as heat-treated glass, heat-toughened glass, case-hardened glass or chemically tempered glass), wired glass, and $\ddagger$  plastic glazing.



**2410.2 Requirement.** Transparent doors and fixed adjacent sidelights shall be marked in accordance with Sections 2410.3 through 2410.5.

**Exceptions:**

1. One- and two-family dwellings.
2. Fixed adjacent transparent sidelights 20 inches (508 mm) or less in width with opaque stiles at least  $1\frac{3}{4}$  inches (44 mm) in width.
3. Where the ground, floor or equivalent surface area in the path of approach to a fixed adjacent transparent sidelight from either side for a minimum distance of 3 feet (914 mm) from such sidelight is so arranged, constructed or designed as to deter persons from approaching such sidelight or a permanent barrier is installed in the path of approach, provided that:
  - 3.1. Decorative pools, horticultural planting or similar installations shall be considered as indicating that the ground, floor or equivalent surface area is not a path of approach.
  - 3.2. Planters, benches and similar barriers which are securely fastened to the floor or wall to prevent their removal shall be considered as blocking the path of approach provided they shall be not less than 18 inches (457 mm) in height from the ground, floor or equivalent surface and extend across at least  $\frac{2}{3}$  of the total width of the glazed area of the sidelight.
4. Fixed adjacent transparent sidelights which are supported by opaque sill and wall construction of at least 18 inches (457 mm) above the ground, floor or equivalent surface immediately adjacent.
5. Display windows in any establishment, building or structure which fall within the definition of a sidelight if the top of the supporting sill and wall construction is not less than 18 inches (457 mm) above the ground, floor or equivalent surface immediately adjacent and the interior area is occupied with merchandise or similar displays to clearly indicate to the public that it is not a means of ingress or egress.
6. Opaque door pulls or push bars extending across at least two-thirds of the total width of the glazed area.

**2410.3 Locations.** Transparent doors and fixed adjacent transparent sidelights shall be marked in two areas on the glass surface. One such area shall be located at least 30 inches (762 mm) but not more than 36 inches (914 mm) above the ground, floor or equivalent surface below the door or sidelight and the other at least 60 inches (1524 mm) but not more than 66 inches (1676 mm) above the ground, floor or equivalent surface below the door or sidelight.

**Exception:** The use of horizontal separation bars, muntin bars or other equivalent bars at least  $1\frac{1}{2}$  inches (38 mm) in vertical dimension that extend across the total width of the glazed area and are located at least 40 inches (1016 mm) but not more than 50 inches (1270 mm) above

the bottom of the door or sidelight is permitted in lieu of markings.

**2410.4 Design.** The marking design shall be at least 4 inches (102 mm) in diameter if circular or 4 inches (102 mm) in its least dimension if elliptical or polygonal, or shall be at least 12 inches (305 mm) in horizontal dimension if the marking is less than 4 inches (102 mm) in its least dimension. In no event shall the vertical dimension of any marking including lettering be less than  $1\frac{1}{2}$  inches (38 mm) in height.

**2410.5 Materials.** Markings may be comprised of, but are not limited to:

1. Muntin bars, separation bars or other equivalent bars;
2. Chemical etching;
3. Sandblasting;
4. Adhesive strips;
5. Decals; or
6. Paint, gilding or other opaque marking materials.

## CHAPTER 25

# GYPSUM BOARD AND PLASTER

### SECTION BC 2501 GENERAL

#### 2501.1 Scope.

**2501.1.1 General.** Provisions of this chapter shall govern the materials, design, construction and quality of gypsum board, lath, gypsum plaster,‡ cement plaster,‡ and cement board.

**2501.1.2 Performance.** Lathing, plastering and gypsum board construction shall be done in the manner, and with the materials, specified in this chapter and referenced standards listed in Chapter 35. When fire protection is required, such construction shall also comply with the provisions of Chapter 7.

**2501.1.3 Other materials.** Other approved wall or ceiling coverings shall be permitted to be installed in accordance with the recommendations of the manufacturer and the approval of the commissioner.

### SECTION BC 2502 DEFINITIONS

**2502.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**CEMENT BOARD.** A fiber reinforced cementitious panel most commonly used under flooring or as a tile backing board. Cement board shall include discrete nonasbestos fiber-cement interior substrate sheets or nonasbestos fiber-mat reinforced cement substrate sheets.

**CEMENT PLASTER.** A mixture of portland or blended cement, portland cement or blended cement and hydrated lime, masonry cement or plastic cement and aggregate and other approved materials as specified in this code.

**EXTERIOR SURFACES.** Weather-exposed surfaces.

**GYPSUM BOARD.** Gypsum wallboard, gypsum sheathing, gypsum base for gypsum veneer plaster, exterior gypsum soffit board, predecorated gypsum board or water-resistant gypsum backing board complying with the standards listed in Tables 2506.2, 2507.2 and Chapter 35.

**GYPSUM PLASTER.** A mixture of calcined gypsum or calcined gypsum and lime and aggregate and other approved materials as specified in this code.

**GYPSUM VENEER PLASTER.** Gypsum plaster applied to an approved base in one or more coats normally not exceeding  $\frac{1}{4}$  inch (6.4 mm) in total thickness.

**INTERIOR SURFACES.** Surfaces other than weather-exposed surfaces.

**WEATHER-EXPOSED SURFACES.** Surfaces of walls, ceilings, floors, roofs, soffits and similar surfaces exposed to the weather except the following:

1. Ceilings and roof soffits enclosed by walls, fascia, bulkheads or beams that extend a minimum of 12 inches (305 mm) below such ceiling or roof soffits.
2. Walls or portions of walls beneath an unenclosed roof area, where located a horizontal distance from an open exterior opening equal to at least twice the height of the opening.
3. Ceiling and roof soffits located a minimum horizontal distance of 10 feet (3048 mm) from the outer edges of the ceiling or roof soffits.

**WIRE BACKING.** Horizontal strands of tautened wire attached to surfaces of vertical supports which, when covered with the building paper, provide a backing for cement plaster.

### SECTION BC 2503 RESERVED

### SECTION BC 2504 VERTICAL AND HORIZONTAL ASSEMBLIES

**2504.1 Scope.** The following requirements shall be met where construction involves gypsum board, lath and plaster in vertical and horizontal assemblies.

**2504.1.1 Wood framing.** Wood supports for lath or gypsum board, as well as wood stripping or furring, shall not be less than 2 inches (51 mm) nominal thickness in the least dimension.

**Exception:** The minimum nominal dimension of wood furring strips installed over solid backing shall not be less than 1 inch by 2 inches (25 mm by 51 mm).

**2504.1.2 Studless partitions.** The minimum thickness of vertically erected studless solid plaster partitions of  $\frac{3}{8}$ -inch (9.5 mm) and  $\frac{3}{4}$ -inch (19.1 mm) rib metal lath or  $\frac{1}{2}$ -inch-thick (12.7 mm) long-length gypsum lath and gypsum board partitions shall be 2 inches (51 mm).

### SECTION BC 2505 SHEAR WALL CONSTRUCTION

**2505.1 Resistance to shear (wood framing).** Wood-framed shear walls sheathed with gypsum board, lath and plaster shall be designed and constructed in accordance with Section 2306.7 of this code and are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

**2505.2 Resistance to shear (steel framing).** Cold-formed steel framed shear walls sheathed with gypsum board and constructed in accordance with the materials and provisions of‡ Section 2210.6 of this code are permitted to resist wind

**2506.1 General.** Gypsum board materials and accessories shall be identified by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored to protect such materials from the weather.

**2506.2 Standards.** Gypsum board materials shall conform to the appropriate standards listed in Table 2506.2 and Chapter 35 and, where required for fire protection, shall conform to the provisions of Chapter 7.

MATERIAL	STANDARD
Accessories for gypsum board	ASTM C 1047
Adhesives for fastening gypsum wallboard	ASTM C 557
Elastomeric joint sealants	ASTM C 920
Exterior soffit board	ASTM C 931
Fiber-reinforced gypsum panels	ASTM C 1278
Glass mat gypsum backing panel	ASTM C 1178
Glass mat gypsum panel	ASTM C 1658
Glass mat gypsum substrate	ASTM C 1177
Gypsum backing board and gypsum shaftliner board	ASTM C 442
Gypsum ceiling board	ASTM C 1395
Gypsum sheathing	ASTM C 79
Gypsum wallboard	ASTM C 36
Joint reinforcing tape and compound	ASTM C 474; C 475
Nails for gypsum boards	ASTM C 514, F 547, F 1667
Predecorated gypsum board	ASTM C 960
Steel screws	ASTM C 954; C 1002
Steel studs, load-bearing	ASTM C 955
Steel studs, nonload bearing	ASTM C 645
Standard specification for gypsum board	ASTM C 1396
Testing gypsum and gypsum products	ASTM C 22; C 472; C 473
Water-resistant gypsum backing board	ASTM C 630

**2506.2.1 Other materials.** Metal suspension systems for acoustical and lay-in panel ceilings shall conform with Section 803.9.

**2506.3 Mold resistance.** Gypsum board or cement board, used in an assembly for the following areas, shall have a mold resistance rating of 10 in accordance with ASTM D3273:

1. Interior faces of exterior walls of basements, cellars, and other below grade rooms;
2. Walls and ceilings of spaces containing condensers, water tanks, water pumps, and pressure reduction valves;

3. Walls and ceilings of laundry rooms;
4. Portions of walls within 2 feet (610 mm) of kitchen sinks to a height of 4 feet (1219 mm) above the floor;
5. Portions of walls within 2 feet (610 mm) of kitchen stoves to a height of 4 feet (1219 mm) above the floor;
6. Walls of bathrooms that are not solely water closet compartments, other than walls specifically required to be cement board;
7. Walls and ceilings in service sink closets; and
8. Portions of walls within 2 feet (610 mm) of mop sinks or service sinks to a height of 4 feet (1219 mm) above the floor.

**2507.1 General.** Lathing and plastering materials and accessories shall be marked by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored in such a manner to protect them from the weather.

**2507.2 Standards.** Lathing and plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 and, where required for fire protection, shall also conform to the provisions of Chapter 7.

<b>MATERIAL</b>	<b>STANDARD</b>
Accessories for gypsum veneer base	ASTM C 1047
Blended cement	ASTM C 595
Exterior plaster bonding compounds	ASTM C 932
Gypsum base for veneer plasters	ASTM C 588
Gypsum casting and molding plaster	ASTM C 59
Gypsum Keene's cement	ASTM C 61
Gypsum lath	ASTM C 37
Gypsum plaster	ASTM C 28
Gypsum veneer plaster	ASTM C 587
Interior bonding compounds, gypsum	ASTM C 631
Lime plasters	ASTM C 5; C 206
Masonry cement	ASTM C 91
Metal lath	ASTM C 847
Plaster aggregates	
Sand	ASTM C 35; C 897
Perlite	ASTM C 35
Vermiculite	ASTM C 35
Plastic cement	ASTM C 1328
Portland cement	ASTM C 150
Steel screws	ASTM C 1002; C 954
Steel studs and track	ASTM C 645; C 955
Welded wire lath	ASTM C 933
Woven wire plaster base	ASTM C 1032

## SECTION BC 2508 GYPSUM CONSTRUCTION

**2508.1 General.** Gypsum board and gypsum plaster construction shall be of the materials listed in Tables 2506.2 and 2507.2. These materials shall be assembled and installed in compliance with the appropriate standards listed in Tables 2508.1 and 2511.1, and Chapter 35.

**TABLE 2508.1  
INSTALLATION OF GYPSUM CONSTRUCTION**

	MATERIAL	STANDARD
NYC	Gypsum board	GA-216; ASTM C 840; ASTM C 1396
	Gypsum sheathing	ASTM C 1280
NYC	Gypsum board $\ddagger$ (Interior)	ASTM C 36
NYC	Gypsum board $\ddagger$ (Exterior)	ASTM C 931
	Gypsum veneer base	ASTM C 844
	Interior lathing and furring	ASTM C 841
	Steel framing for gypsum boards	ASTM C 754; C 1007

**2508.2 Limitations.** Gypsum wallboard or gypsum plaster shall not be used in any exterior surface where such gypsum construction will be exposed directly to the weather. Gypsum wallboard shall not be used where there will be direct exposure to water or continuous high humidity conditions beyond the published recommendations of the manufacturer. Gypsum sheathing shall be installed on exterior surfaces in accordance with ASTM C 1280.

**2508.2.1 Weather protection.** Gypsum wallboard, gypsum lath or gypsum plaster shall not be installed until weather protection for the installation is provided.

**2508.3 Single-ply application.** Edges and ends of gypsum board shall occur on the framing members, except those edges and ends that are perpendicular to the framing members. Edges and ends of gypsum board shall be in moderate contact except in concealed spaces where fire-resistance-rated construction, shear resistance or diaphragm action is not required.

**2508.3.1 Floating angles.** Fasteners at the top and bottom plates of vertical assemblies, or the edges and ends of horizontal assemblies perpendicular to supports, and at the wall line are permitted to be omitted except on shear resisting elements or fire-resistance-rated assemblies. Fasteners shall be applied in such a manner as not to fracture the face paper with the fastener head.

**2508.4 Joint treatment.** Gypsum board fire-resistance-rated assemblies shall have joints and fasteners treated.

**Exception:** Joint and fastener treatment need not be provided where any of the following conditions occur:

1. Where the gypsum board is to receive a decorative finish such as wood paneling, battens, acoustical finishes or any similar application that would be equivalent to joint treatment.
2. On single-layer systems where joints occur over wood framing members.
3. Square edge or tongue-and-groove edge gypsum board (V-edge), gypsum backing board or gypsum sheathing.
4. On multilayer systems where the joints of adjacent layers are offset from one to another.
5. Assemblies tested without joint treatment.

**2508.5 Horizontal gypsum board diaphragm ceilings.** Gypsum board shall be permitted to be used on woodjoists to create a horizontal diaphragm ceiling in accordance with Table 2508.5.

**2508.5.1 Diaphragm proportions.** The maximum allowable diaphragm proportions shall be 1 $\frac{1}{2}$ :1 between shear resisting elements. Rotation or cantilever conditions shall not be permitted.

**TABLE 2508.5  
SHEAR CAPACITY FOR HORIZONTAL WOOD FRAMED GYPSUM BOARD DIAPHRAGM CEILING ASSEMBLIES**

MATERIAL	THICKNESS OF MATERIAL (MINIMUM) (inches)	SPACING OF FRAMING MEMBERS (MAXIMUM) (inches)	SHEAR VALUE <sup>a,b</sup> (plf of ceiling)	MINIMUM FASTENER SIZE
Gypsum board	$\frac{1}{2}$	16 o.c.	90	5d cooler or wallboard nail; 1 $\frac{5}{8}$ -inch long; 0.086-inch shank; 15/64 -inch head <sup>c</sup>
Gypsum board	$\frac{1}{2}$	24 o.c.	70	5d cooler or wallboard nail; 1 $\frac{5}{8}$ -inch long; 0.086-inch shank; 15/64 -inch head <sup>c</sup>

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.59 N/m.

a. Values are not cumulative with other horizontal diaphragm values and are for short-term loading due to wind or seismic loading. Values shall be reduced 25 percent for normal loading.

b. Values shall be reduced 50 percent in Seismic Design Categories D, E and F.

c. 1 $\frac{1}{4}$ -inch, No. 6 Type S or W screws are permitted to be substituted for the listed nails.



**2508.5.2 Installation.** Gypsum board used in a horizontal diaphragm ceiling shall be installed perpendicular to ceiling framing members. Endjoints of adjacent courses of gypsum board shall not occur on the same joist.

**2508.5.3 Blocking of perimeter edges.** All perimeter edges shall be blocked using a wood member not less than 2-inch by 6-inch (51 mm by 152 mm) nominal dimension. Blocking material shall be installed flat over the top plate of the wall to provide a nailing surface not less than 2 inches (51 mm) in width for the attachment of the gypsum board.

**2508.5.4 Fasteners.** Fasteners used for the attachment of gypsum board to a horizontal diaphragm ceiling shall be as defined in Table 2508.5. Fasteners shall be spaced not more than 7 inches (178 mm) on center (o.c.) at all supports, including perimeter blocking, and not more than  $\frac{3}{8}$  inch (9.5 mm) from the edges and ends of the gypsum board.

**2508.5.5 Lateral force restrictions.** Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by masonry or concrete construction.

## SECTION BC 2509 GYPSUM BOARD IN SHOWERS AND WATER CLOSETS

**2509.1 Wet areas.** Showers and public toilet walls shall conform to Sections 1210.2 and 1210.3.

**2509.2 Base for tile.** Glass mat water-resistant gypsum backing panels, discrete nonasbestos fiber-cement interior substrate sheets or nonasbestos fiber-mat reinforced cement substrate sheets in compliance with ASTM C 1178, C 1288 or C 1325 and installed in accordance with manufacturer recommendations shall be used as a base for wall tile in tub and shower areas and wall and ceiling panels in shower areas. Water-resistant gypsum backing board shall be used as a base for tile in water closet compartment walls when installed in accordance with GA-216 or ASTM C 840 and manufacturer recommendations. Regular gypsum wallboard is permitted under tile or wall panels in other wall and ceiling areas when installed in accordance with GA-216 or ASTM C 840.

**2509.3 Limitations.** Water-resistant gypsum backing board shall not be used in the following locations:

1. Over a vapor retarder in shower or bathtub compartments.
2. Where there will be direct exposure to water or in areas subject to continuous high humidity.
3. On ceilings where frame spacing exceeds 12 inches (305 mm) o.c. for  $\frac{1}{2}$ -inch-thick (12.7 mm) water-resistant gypsum backing board and more than 16 inches (406 mm) o.c. for  $\frac{5}{8}$ -inch-thick (15.9 mm) water-resistant gypsum backing board.

## SECTION BC 2510 LATHING AND FURRING FOR CEMENT PLASTER (STUCCO)

**2510.1 General.** Exterior and interior cement plaster and lathing shall be done with the appropriate materials listed in Table 2507.2 and Chapter 35.

**2510.2 Weather protection.** Materials shall be stored in such a manner as to protect such materials from the weather.

**2510.3 Installation.** Installation of these materials shall be in compliance with ASTM C 926 and ASTM C 1063.

**2510.4 Corrosion resistance.** Metal lath and lath attachments shall be of corrosion-resistant material.

**2510.5 Backing.** Backing or a lath shall provide sufficient rigidity to permit plaster applications.

**2510.5.1 Support of lath.** Where lath on vertical surfaces extends between rafters or other similar projecting members, solid backing shall be installed to provide support for lath and attachments.

**2510.5.2 Use of gypsum backing board.**

**2510.5.2.1 Use of gypsum board as a backing board.** Gypsum lath or gypsum wallboard shall not be used as a backing for cement plaster.

**Exception:** Gypsum lath or gypsum wallboard is permitted, with a water-resistive barrier, as a backing for self-furred metal lath or self-furred wire fabric lath and cement plaster where either of the following conditions occur:

1. On horizontal supports of ceilings or roof soffits.
2. On interior walls.

**2510.5.2.2 Use of gypsum sheathing backing.** Gypsum sheathing is permitted as a backing for metal or wire fabric lath and cement plaster on walls. A water-resistive barrier shall be provided in accordance with Section 2510.6.

**2510.5.3 Backing not required.** Wire backing is not required under expanded metal lath or paperbacked wire fabric lath.

**2510.6 Water-resistive barriers.** Water-resistive barriers shall be installed as required in Section 1404.2 and, where applied over wood-based sheathing, shall include a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper.

**Exception:** Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or drainage space.

**2510.7 Preparation of masonry and concrete.** Surfaces shall be clean, free from efflorescence, sufficiently damp and rough for proper bond. If the surface is insufficiently rough, approved bonding agents or a portland cement dash bond coat mixed in proportions of not more than two parts volume of sand to one part volume of portland cement or plastic

cement shall be applied. The dash bond coat shall be left undisturbed and shall be moist cured not less than 24 hours.

## SECTION BC 2511 INTERIOR PLASTER

**2511.1 General.** Plastering gypsum plaster or cement plaster shall not be less than three coats where applied over metal lath or wire fabric lath and not less than two coats where applied over other bases permitted by this chapter.

**Exception:** Gypsum veneer plaster and cement plaster specifically designed and approved for one-coat applications.

**TABLE 2511.1**  
**INSTALLATION OF PLASTER CONSTRUCTION**

MATERIAL	STANDARD
Cement plaster	ASTM C 926
Gypsum plaster	ASTM C 842
Gypsum veneer plaster	ASTM C 843
Interior lathing and furring (gypsum plaster)	ASTM C 841
Lathing and furring (cement plaster)	ASTM C 1063
Steel framing	ASTM C 754; C 1007

**2511.1.1 Installation.** Installation of lathing and plaster materials shall conform with Table 2511.1 and Section 2507.

**2511.2 Limitations.** Plaster shall not be applied directly to fiber insulation board. Cement plaster shall not be applied directly to gypsum lath or gypsum plaster except as specified in Sections 2510.5.1 and 2510.5.2.

**2511.3 Grounds.** Where installed, grounds shall ensure the minimum thickness of plaster as set forth in ASTM C 842 and ASTM C 926. Plaster thickness shall be measured from the face of lath and other bases.

**2511.4 Interior masonry or concrete.** Condition of surfaces shall be as specified in Section 2510.7. Approved specially prepared gypsum plaster designed for application to concrete surfaces or approved acoustical plaster is permitted. The total thickness of base coat plaster applied to concrete ceilings shall be as set forth in ASTM C 842 or ASTM C 926. Should ceiling surfaces require more than the maximum thickness permitted in ASTM C 842 or ASTM C 926, metal lath or wire fabric lath shall be installed on such surfaces before plastering.

**2511.5 Wet areas.** Showers and public toilet walls shall conform to Sections 1210.2 and 1210.3. When wood frame walls and partitions are covered on the interior with cement plaster or tile of similar material and are subject to water splash, the framing shall be protected with an approved moisture barrier.

## SECTION BC 2512 EXTERIOR PLASTER

**2512.1 General.** Plastering with cement plaster shall be not less than three coats when applied over metal lath or wire fabric lath or gypsum board backing as specified in Section 2510.5 and shall be not less than two coats when applied over masonry or concrete. If the plaster surface is to be completely covered by veneer or other facing material, or is completely concealed by another wall, plaster application need be only two coats, provided the total thickness is as set forth in ASTM C 926. NYC

**2512.1.1 On-grade floor slab.** On wood framed or steel stud construction with an on-grade concrete floor slab system, exterior plaster shall be applied in such a manner as to cover, but not to extend below, the lath and paper. The application of lath, paper and flashing or drip screeds shall comply with ASTM C 1063.

**2512.1.2 Weep screeds.** A minimum 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage), corrosion-resistant weep screed with a minimum vertical attachment flange of 3½ inches (89 mm) shall be provided at or below the foundation plate line on exterior stud walls in accordance with ASTM C 926. The weep screed shall be placed a minimum of 4 inches (102 mm) above the earth or 2 inches (51 mm) above paved areas and be of a type that will allow trapped water to drain to the exterior of the building. The water-resistive barrier shall lap the attachment flange. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

**2512.2 Plasticity agents.** Only approved plasticity agents and approved amounts thereof shall be added to Portland cement or blended cements. When plastic cement or masonry cement is used, no additional lime or plasticizers shall be added. Hydrated lime or the equivalent amount of lime putty used as a plasticizer is permitted to be added to cement plaster or cement and lime plaster in an amount not to exceed that set forth in ASTM C 926.

**2512.3 Limitations.** Gypsum plaster shall not be used on exterior surfaces.

**2512.4 Cement plaster.** Plaster coats shall be protected from freezing for a period of not less than 24 hours after set has occurred. Plaster shall be applied when the ambient temperature is higher than 40°F (4°C), unless provisions are made to keep cement plaster work above 40°F (4°C) during application and 48 hours thereafter.

**2512.5 Second-coat application.** The second coat shall be brought out to proper thickness, rodded and floated sufficiently rough to provide adequate bond for the finish coat. The second coat shall have no variation greater than ¼ inch (6.4 mm) in any direction under a 5-foot (1524 mm) straight edge.

**2512.6 Curing and interval.** First and second coats of cement plaster shall be applied and moist cured as set forth in ASTM C 926 and Table 2512.6.

**TABLE 2512.6  
CEMENT PLASTERS<sup>a</sup>**

COAT	MINIMUM PERIOD MOIST CURING	MINIMUM INTERVAL BETWEEN COATS
First	48 hours <sup>a</sup>	48 hours <sup>b</sup>
Second	48 hours	7 days <sup>c</sup>
Finish	—	Note c

a. The first two coats shall be as required for the first coats of exterior plaster, except that the moist-curing time period between the first and second coats shall not be less than 24 hours. Moist curing shall not be required where job and weather conditions are favorable to the retention of moisture in the cement plaster for the required time period.

b. Twenty-four-hour minimum interval between coats of interior cement plaster. For alternate method of application, see Section 2512.8.

NYC c. Finish coat plaster is permitted to be applied to interior cement base coats after a 48-hour period.

**2512.7 Application to solid backings.** Where applied over gypsum backing as specified in Section 2510.5 or directly to unit masonry surfaces, the second coat is permitted to be applied as soon as the first coat has attained sufficient hardness.

**2512.8 Alternate method of application.** The second coat is permitted to be applied as soon as the first coat has attained sufficiently rigidity to receive the second coat.

**2512.8.1 Admixtures.** When using this method of application, calcium aluminate cement up to 15 percent of the weight of the portland cement is permitted to be added to the mix.

**2512.8.2 Curing.** Curing of the first coat is permitted to be omitted and the second coat shall be cured as set forth in ASTM C 926 and Table 2512.6.

**2512.9 Finish coats.** Cement plaster finish coats shall be applied over base coats that have been in place for the time periods set forth in ASTM C 926. The third or finish coat shall be applied with sufficient material and pressure to bond and to cover the brown coat and shall be of sufficient thickness to conceal the brown coat.

## **SECTION BC 2513 EXPOSED AGGREGATE PLASTER**

**2513.1 General.** Exposed natural or integrally colored aggregate is permitted to be partially embedded in a natural or colored bedding coat of cement plaster or gypsum plaster, subject to the provisions of this section.

**2513.2 Aggregate.** The aggregate shall be applied manually or mechanically and shall consist of marble chips, pebbles or similar durable, moderately hard (three or more on the Mohs hardness scale), nonreactive materials.

**2513.3 Bedding coat proportions.** The bedding coat for interior or exterior surfaces shall be composed of one part Portland cement and one part Type S lime; or one part blended cement and one part Type S lime; or masonry cement; or plastic cement, and a maximum of three parts of graded white or natural sand by volume. The bedding coat for interior surfaces shall be composed of 100 pounds (45.4 kg) of neat gypsum plaster and a maximum of 200 pounds

(90.8 kg) of graded white sand. A factory-prepared bedding coat for interior or exterior use is permitted. The bedding coat for exterior surfaces shall have a minimum compressive strength of 1,000 pounds per square inch (psi) (6895 kPa).

**2513.4 Application.** The bedding coat is permitted to be applied directly over the first (scratch) coat of plaster, provided the ultimate overall thickness is a minimum of  $\frac{7}{8}$  inch (22 mm), including lath. Over concrete or masonry surfaces, the overall thickness shall be a minimum of  $\frac{1}{2}$  inch (12.7 mm).

**2513.5 Bases.** Exposed aggregate plaster is permitted to be applied over concrete, masonry, cement plaster base coats or gypsum plaster base coats installed in accordance with Section 2511 or 2512.

**2513.6 Preparation of masonry and concrete.** Masonry and concrete surfaces shall be prepared in accordance with the provisions of Section 2510.7.

**2513.7 Curing of base coats.** Cement plaster base coats shall be cured in accordance with ASTM C 926. Cement plaster bedding coats shall retain sufficient moisture for hydration (hardening) for 24 hours minimum or, where necessary, shall be kept damp for 24 hours by light water spraying.

## CHAPTER 26

# PLASTIC

### SECTION BC 2601 GENERAL

**2601.1 Scope.** These provisions shall govern the materials, design, application, construction and installation of foam plastic, foam plastic insulation, plastic veneer, interior plastic finish and trim, and light-transmitting plastics. See Chapter 14 for requirements for exterior wall finish and trim.

### SECTION BC 2602 DEFINITIONS

**2602.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**FIBER REINFORCED POLYMER.** A polymeric composite material consisting of reinforcement fibers impregnated with a fiber-binding polymer which is then molded and hardened.

**FIBERGLASS REINFORCED POLYMER.** A polymeric composite material consisting of glass reinforcement fibers impregnated with a fiber-binding polymer which is then molded and hardened.

**FOAM PLASTIC INSULATION.** A plastic that is intentionally expanded by the use of a foaming agent to produce a reduced-density plastic containing voids consisting of open or closed cells distributed throughout the plastic for thermal insulating or acoustical purposes and that has a density less than 20 pounds per cubic foot (pcf) (320 kg/m<sup>3</sup>).

**LIGHT-DIFFUSING SYSTEM.** Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

**LIGHT-TRANSMITTING PLASTIC ROOF PANELS.** Structural plastic panels other than skylights that are fastened to structural members, or panels or sheathing, and that are used as light-transmitting media in the plane of the roof.

**LIGHT-TRANSMITTING PLASTIC WALL PANELS.** Plastic materials that are fastened to structural members, or to structural panels or sheathing, and that are used as light-transmitting media in exterior walls.

**PLASTIC, APPROVED.** Any thermoplastic, thermosetting or reinforced thermosetting plastic material that conforms to combustibility classifications specified in the section applicable to the application and plastic type.

**PLASTIC GLAZING.** Plastic materials that are glazed or set in frame or sash and not held by mechanical fasteners that



**THERMOPLASTIC MATERIAL.** A plastic material that is capable of being repeatedly softened by increase of temperature and hardened by decrease of temperature.

**THERMOSETTING MATERIAL.** A plastic material that is capable of being changed into a substantially nonreformable product when cured.

### SECTION BC 2603 FOAM PLASTIC INSULATION

**2603.1 General.** The provisions of this section shall govern the requirements and uses of foam plastic insulation in buildings and structures.

**2603.2 Labeling and identification.** Packages and containers of foam plastic insulation and foam plastic insulation components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, the product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

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**2603.3 Surface-burning characteristics.** Unless otherwise indicated in this section, foam plastic insulation and foam plastic cores of manufactured assemblies shall have a flame spread index of not more than 75 and a smoke-developed index of not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E 84 or UL 723. Loose fill-type foam plastic insulation shall be tested as board stock for the flame spread index and smoke-developed indexes.

#### Exceptions:

1. Foam plastic interior trim shall comply with the flame spread and smoke-developed indexes as provided for in Section 2604.2.
2. In cold storage buildings, ice plants, food plants, food processing rooms and similar areas, foam plastic insulation where tested in a thickness of 4 inches (102 mm) shall be permitted in a thickness up to 10 inches (254 mm) where the building is equipped throughout with an automatic fire sprinkler system in accordance with Section 903.3.1.1. The approved automatic sprinkler system shall be provided in both the room and that part of the building in which the room is located.
3. Foam plastic insulation that is a part of a Class A, B or C roof-covering assembly shall be exempt from the flame spread requirements of this section provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256. The smoke-developed index shall not be limited for roof applications.

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NYC 4. Foam plastic insulation greater than 4 inches (102 mm) in thickness shall have a maximum flame spread index of 75 and a smoke-developed index of 450 where tested at a minimum thickness of 4 inches (102 mm), provided the end use is approved in accordance with Section 2603.9 using the thickness and density intended for use.

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NYC 5. Foam plastic interior signs in covered mall buildings shall not be required to comply with the flame spread and smoke-developed indexes of this section, provided the signs comply with Section 402.16.

**2603.4 Thermal barrier.** Except as provided for in Sections 2603.4.1 and 2603.9, foam plastic shall be separated from the interior of a building by an approved thermal barrier of 1/2-inch (12.7 mm) gypsum wallboard or equivalent thermal barrier material that will limit the average temperature rise of the unexposed surface to not more than 250°F (120°C) after 15 minutes of fire exposure, complying with the standard time-temperature curve of ASTM E 119 or UL 263. The thermal barrier shall be installed in such a manner that it will remain in place for 15 minutes based on FM 4880, UL 1040, NFPA 286 or UL 1715. Combustible concealed spaces shall NYC comply with Section 717 of this code.

**2603.4.1 Thermal barrier not required.** The thermal barrier specified in Section 2603.4 is not required under the conditions set forth in Sections 2603.4.1.1 through 2603.4.1.13.

NYC **2603.4.1.1 Masonry or concrete construction.** A thermal barrier is not required for foam plastic† insulation installed in a masonry or concrete wall, floor or roof system where the foam plastic insulation is covered on‡ each face †by a minimum of 1 inch (25 mm) thickness of masonry or concrete.

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NYC **2603.4.1.2 Cooler and freezer walls.** Foam plastic installed in a maximum thickness of 10 inches (254 mm) in cooler and freezer walls shall be permitted without thermal barrier, provided that the walls:

1. Have a flame spread index of 25 or less and a smoke-developed index of not more than 450, where tested in a minimum 4-inch (102 mm) thickness.
2. Have flash ignition and self-ignition temperatures of not less than 600°F and 800°F (316°C and 427°C), respectively.
3. Have a covering of not less than 0.032-inch (0.8 mm) aluminum or corrosion-resistant steel having a base metal thickness not less than 0.0160 inch (0.4 mm) at any point.

NYC 4. Are protected by an automatic sprinkler system in accordance with Section 903.3.1.1. Where the cooler or freezer is within a building, both the cooler or freezer and that part of the building in which it is located shall be sprinklered.

NYC **2603.4.1.3 Walk-in coolers.** In nonsprinklered buildings, foam plastic having a thickness that does not exceed 4 inches (102 mm) and a maximum flame spread index of 75 is permitted without thermal barrier

in walk-in coolers or freezer units where the aggregate floor area does not exceed 400 square feet (37 m²) and the foam plastic is covered by a metal facing not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm). A thickness of up to 10 inches (254 mm) is permitted where protected by a thermal barrier.

**2603.4.1.4 Exterior walls—one-story buildings.** For one-story buildings, foam plastic having a flame spread index of 25 or less, and a smoke-developed index of not more than 450, shall be permitted without thermal barriers in or on exterior walls in a thickness not more than 4 inches (102 mm) where the foam plastic is covered by a thickness of not less than 0.032-inch-thick (0.81 mm) aluminum or corrosion-resistant steel having a base metal thickness of 0.0160 inch (0.41 mm) and the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

**2603.4.1.5 Roofing.** In construction classes that permit wood sheathing, foam plastic insulation under a roof assembly or roof covering shall be permitted without a thermal barrier, provided that it is installed in accordance with the code and the manufacturer's instructions. It shall be separated from the interior of the building by wood structural panel sheathing not less than 0.47 inch (11.9 mm) in thickness bonded with exterior glue, with edges supported by blocking, tongue-and-groove joints or other approved type of edge support, or an equivalent material. A thermal barrier is not required for foam plastic insulation that is a part of a Class A, B or C roof-covering assembly, provided the assembly with the foam plastic insulation satisfactorily passes FM 4450 or UL 1256. NYC  
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**2603.4.1.6 Attics and crawl spaces.** Within an attic or crawl space where entry is made only for service of utilities, foam plastic insulation shall be permitted without thermal barrier if protected against ignition by 1 1/2-inch-thick (38 mm) mineral fiber insulation; 1/4-inch-thick (6.4 mm) wood structural panel, particle-board or hardboard; 3/8-inch (9.5 mm) gypsum wall-board, corrosion-resistant steel having a base metal thickness of 0.016 inch (0.4 mm) or other approved material installed in such a manner that the foam plastic insulation is not exposed. The protective covering shall be consistent with the requirements for the type of construction. NYC  
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**2603.4.1.7 Doors not required to have a fire protection rating.** Where pivoted or side-hinged doors are permitted without a fire protection rating, foam plastic insulation, having a flame spread index of 75 or less and a smoke-developed index of not more than 450, shall be permitted as a core material without a thermal barrier where the door facing is of metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or steel having a base metal thickness of not less than 0.016 inch (0.4 mm) at any point. NYC  
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**2603.4.1.8 Exterior doors in buildings of Group R-2 or R-3.** In occupancies classified as Group R-2 or R-3, foam-filled exterior entrance doors to individual dwelling units that do not require a fire-resistance rating shall be permitted without a thermal barrier, provided that the doors are faced with wood or other approved materials.

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**2603.4.1.9 Garage doors.** Where garage doors are permitted without a fire-resistance rating, foam plastic is permitted as a core material, provided that the door facing shall be metal having a minimum thickness of 0.032-inch (0.8 mm) aluminum or 0.010-inch (0.25 mm) steel or the facing shall be minimum 0.125-inch-thick (3.2 mm) wood. Garage doors having facings other than those described above shall be tested in accordance with, and meet the acceptance criteria of DASMA 107.

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**2603.4.1.9.1 Garage doors in one- and two-family dwellings.** Garage doors using foam plastic insulation complying with Section 2603.3 in detached and attached garages associated with one- and two-family dwellings need not be provided with a thermal barrier.

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**2603.4.1.10 Siding backer board.** Foam plastic insulation of not more than 2,000 British thermal units per square foot (Btu/sq. ft.) (22.7 mJ/m<sup>2</sup>) as determined by NFPA 259 shall be permitted as a siding backer board with a maximum thickness of 1/2 inch (12.7 mm) without a thermal barrier, provided it is separated from the interior of the building by not less than 2 inches (51 mm) of mineral fiber insulation or equivalent or where applied as insulation over existing wall construction.

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**2603.4.1.11 Interior trim.** Foam plastic used as interior trim in accordance with Section 2604 shall be permitted without a thermal barrier.

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**2603.4.1.12 Interior signs.** Foam plastic used for interior signs in covered mall buildings in accordance with Section 402.16 of this code shall be permitted without a thermal barrier. Foam plastic signs that are not affixed to interior building surfaces shall comply with Chapter 8 of the *New York City Fire Code*.

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**2603.4.1.13 Type V construction.** Foam plastic spray applied to a sill plate and header of Type V construction is permitted without a thermal barrier, subject to all of the following:

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1. The maximum thickness of the foam plastic shall be 3 1/4-inches (82.6 mm).
2. The density of the foam plastic shall be in the range of 1.5 to 2.0 pcf (24 to 32 kg/m<sup>3</sup>).
3. The foam plastic shall have a flame spread index of 25 or less and an accompanying smoke-developed index of 450 or less when tested in accordance with ASTM E 84 or UL 723.

**2603.5 Exterior walls of buildings of any height.** Exterior walls of buildings of Type I, II, III or IV construction of any height shall comply with Sections 2603.5.1 through 2603.5.7. Exterior walls of cold storage buildings required to

be constructed of noncombustible materials, where the building is more than one story in height, shall also comply with the provisions of Sections 2603.5.1 through 2603.5.7. Exterior walls of buildings of Type V construction shall comply with Sections 2603.2, 2603.3 and 2603.4.

**2603.5.1 Fire-resistance-rated walls.** Where the wall is required to have a fire-resistance rating, data based on tests conducted in accordance with ASTM E 119 or UL 263 shall be provided to substantiate that the fire-resistance rating is maintained.

**2603.5.2 Thermal barrier.** Any foam plastic insulation shall be separated from the building interior by a thermal barrier meeting the provisions of Section 2603.4, unless special approval is obtained on the basis of Section 2603.9.

**Exception:** One-story buildings complying with Section 2603.4.1.4.

**2603.5.3 Potential heat.** The potential heat of foam plastic insulation in any portion of the wall or panel shall not exceed the potential heat expressed in Btu per square foot (mJ/m<sup>2</sup>) of the foam plastic insulation contained in the wall assembly tested in accordance with Section 2603.5.5. The potential heat of the foam plastic insulation shall be determined by tests conducted in accordance with NFPA 259 and the results shall be expressed in Btu per square foot (mJ/m<sup>2</sup>).

**Exception:** One-story buildings complying with Section 2603.4.1.4.

**2603.5.4 Flame spread and smoke-developed indexes.** Foam plastic insulation, exterior coatings and facings shall be tested separately in the thickness intended for use, but not to exceed 4 inches (102 mm), and shall each have a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E 84 or UL 723.

**Exception:** Prefabricated or factory-manufactured panels having minimum 0.020-inch (0.51 mm) aluminum facings and a total thickness of 1/4-inch (6.4 mm) or less are permitted to be tested as an assembly where the foam plastic core is not exposed in the course of construction.

**2603.5.5 Test standard.** The wall assembly shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

**Exception:** One-story buildings complying with Section 2603.4.1.4.

**2603.5.6 Label required.** The edge or face of each piece of foam plastic insulation shall bear the label of an approved agency. The label shall contain the manufacturer's or distributor's identification, model number, serial number or definitive information describing the product or materials' performance characteristics and approved agency's identification.

**2603.5.7 Ignition.** Exterior walls shall not exhibit sustained flaming where tested in accordance with NFPA 268. Where a material is intended to be installed in more

than one thickness, tests of the minimum and maximum thickness intended for use shall be performed.

**Exception:** Assemblies protected on the outside with one of the following:

1. A thermal barrier complying with Section 2603.4.
2. A minimum 1-inch (25 mm) thickness of concrete or masonry.
3. Glass-fiber-reinforced concrete panels of a minimum thickness of  $\frac{3}{8}$ -inch (9.5 mm).
4. Metal-faced panels having minimum 0.019-inch-thick (0.48 mm) aluminum or 0.016-inch thick (0.41 mm) corrosion-resistant steel outer facings.
5. A minimum  $\frac{7}{8}$ -inch (22.2 mm) thickness of stucco complying with Section 2510.

**NYC 2603.6 Roofing assembly.** Foam plastic insulation meeting the requirements of Sections 2603.2, 2603.3 and 2603.4 shall be permitted as part of a roof-covering assembly, provided the assembly with the foam plastic insulation is a Class A, B or C roofing assembly where tested in accordance with ASTM E 108 or UL 790.

**2603.7 Plenums.** Foam plastic insulation shall not be used as interior wall or ceiling finish in plenums except as permitted in Section 2604 or when protected by a thermal barrier in accordance with Section 2603.4.

**2603.8 Protection against termites.** In areas where the probability of termite infestation is very heavy in accordance with

Figure 2603.8, extruded and expanded polystyrene, polyisocyanurate and other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below grade. The clearance between foam plastics installed above grade and exposed earth shall be at least 6 inches (152 mm).

**Exceptions:**

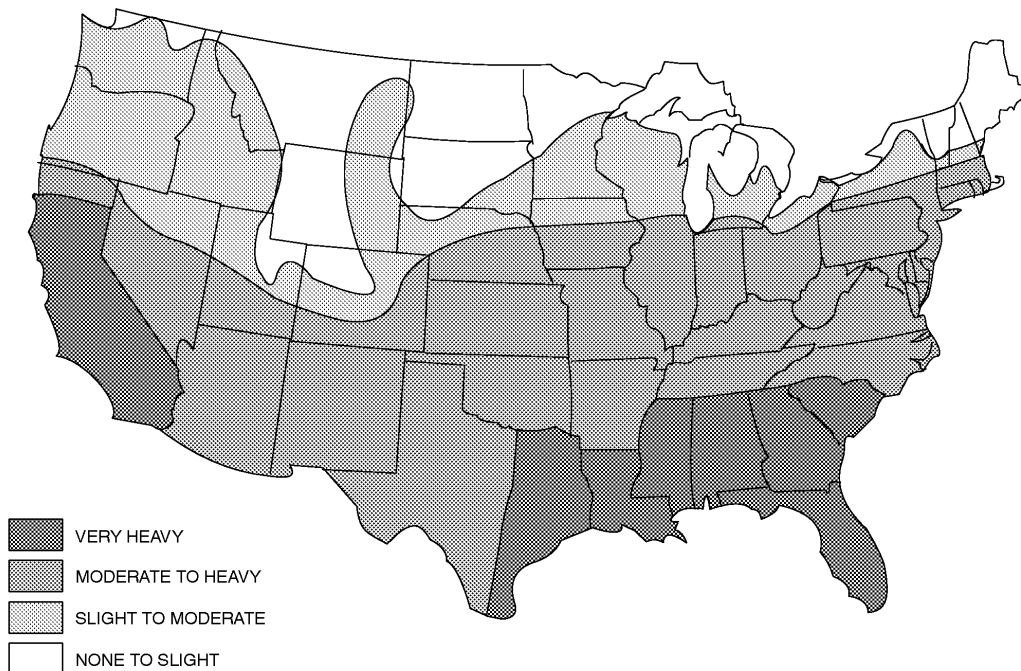
1. Buildings where the structural members of walls, floors, ceilings and roofs are entirely of noncombustible materials or preservative-treated wood;
2. An approved method of protecting the foam plastic and structure from subterranean termite damage is provided; or
3. On the interior side of basement walls.

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**2603.9 Special approval.** Foam plastic shall not be required to comply with the requirements of Sections 2603.4 through 2603.7, where specifically approved by the department based on large-scale tests such as, but not limited to, NFPA 286 (with the acceptance criteria of Section 803.2 of this code), FM 4880, UL 1040 or UL 1715. Such testing shall be related to the actual end-use configuration and be performed on the finished manufactured foam plastic assembly in the maximum thickness intended for use. Foam plastics that are used as interior finish on the basis of special tests shall also conform to the flame spread requirements of Chapter 8. Assemblies tested shall include seams, joints and other typical details used in the installation of the assembly and shall be tested in the manner intended for use.

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**FIGURE 2603.8**  
**TERMITE INFESTATION PROBABILITY MAP**



## SECTION BC 2604 INTERIOR FINISH AND TRIM

**2604.1 General.** Plastic materials installed as interior finish or trim shall comply with Chapter 8. Foam plastics shall only be installed as interior finish where approved in accordance with the special provisions of Section 2603.9. Foam plastics that are used as interior finish shall also meet the flame spread index requirements for interior finish in accordance with Chapter 8. Foam plastics installed as interior trim shall comply with Section 2604.2.

**NYC 2604.2 Foam plastic interior trim.** Foam plastic used as interior trim shall comply with Sections 2604.2.1 through 2604.2.4.

**2604.2.1 Density.** The minimum density of the interior trim shall be 20 pcf (320 kg/m<sup>3</sup>).

**2604.2.2 Thickness.** The maximum thickness of the interior trim shall be 1/2-inch (12.7 mm) and the maximum width shall be 8 inches (204 mm).

**NYC 2604.2.3 Area limitation.** The interior trim shall not constitute more than 10 percent of the specific wall or ceiling area to which it is attached.

**2604.2.4 Flame spread.** The flame spread index shall not exceed 75 where tested in accordance with ASTM E 84 or UL 723. The smoke-developed index shall not be limited.

**NYC Exception:** When the interior trim material has been tested as an interior finish in accordance with NFPA 286 and complies with the acceptance criteria in Section 803.1.2.1 of this code, it shall not be required to be tested for flame spread index in accordance with ASTM E 84 or UL 723.

## SECTION BC 2605 PLASTIC VENEER

**2605.1 Interior use.** Where used within a building, plastic veneer shall comply with the interior finish requirements of Chapter 8.

**2605.2 Exterior use.** Exterior plastic veneer, other than plastic siding, shall be permitted to be installed on the exterior walls of buildings of any type of construction in accordance with all of the following requirements:

1. Plastic veneer shall comply with Section 2606.4.
2. Plastic veneer shall not be attached to any exterior wall to a height greater than 50 feet (15 240 mm) above grade.
3. Sections of plastic veneer shall not exceed 300 square feet (27.9 m<sup>2</sup>) in area and shall be separated by a minimum of 4 feet (1219 mm) vertically.

**Exception:** The area and separation requirements and the smoke-density limitation are not applicable to plastic veneer applied to buildings constructed of Type VB construction, provided the walls are not required to have a fire-resistance rating.

**2605.3 Plastic siding.** Plastic siding shall comply with the requirements of Sections 1404 and 1405.

## SECTION BC 2606 LIGHT-TRANSMITTING PLASTICS

**2606.1 General.** The provisions of this section and Sections 2607 through 2611 shall govern the quality and methods of application of light-transmitting plastics for use as light-transmitting materials in buildings and structures. Foam plastics shall comply with Section 2603. Light-transmitting plastic materials that meet the other code requirements for walls and roofs shall be permitted to be used in accordance with the other applicable chapters of the code.

**2606.2 Approval for use.** Sufficient technical data shall be submitted to substantiate the proposed use of any light-transmitting material, as approved by the department and subject to the requirements of this section.

**2606.3 Identification.** Each unit or package of light-transmitting plastic shall be identified with a mark or decal satisfactory to the commissioner, which includes identification as to the material classification.

**2606.4 Specifications.** Light-transmitting plastics, including thermoplastic, thermosetting or reinforced thermosetting plastic material, shall have a self-ignition temperature of 650°F (343°C) or greater where tested in accordance with ASTM D 1929; a smoke-developed index not greater than 450 where tested in the manner intended for use in accordance with ASTM E 84 or UL 723, or a maximum average smoke density rating not greater than 75 where tested in the thickness intended for use in accordance with ASTM D 2843 and shall conform to one of the following combustibility classifications:

**Class CC1:** Plastic materials that have a burning extent of 1 inch (25 mm) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D 635.‡

**Class CC2:** Plastic materials that have a burning rate of 2 1/2-inches per minute (1.06 mm/s) or less where tested at a nominal thickness of 0.060 inch (1.5 mm), or in the thickness intended for use, in accordance with ASTM D 635.

**2606.5 Structural requirements.** Light-transmitting plastic materials in their assembly shall be of adequate strength and durability to withstand the loads indicated in Chapter 16. Technical data shall be submitted to establish stresses, maximum unsupported spans and such other information for the various thicknesses and forms used as deemed necessary by the department.

**2606.6 Fastening.** Fastening shall be adequate to withstand the loads in Chapter 16. Proper allowance shall be made for expansion and contraction of light-transmitting plastic materials in accordance with accepted data on the coefficient of expansion of the material and other material in conjunction with which it is employed.



**NYC 2606.7 Light-diffusing systems.** Light-diffusing systems shall comply with Sections 2603.7.1 through 2603.7.5. Light-diffusing systems shall not be installed in the following occupancies and locations:

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1. Any room in which the net floor area per occupant is 20 square feet (1.86 m<sup>2</sup>) or less, or any room leading therefrom through which it is necessary for occupants to pass in order to reach the only exit.
  2. Group I-2.
  3. Group I-3.
  4. Vertical exit enclosures and exit passageways.

**2606.7.1 Support.** Light-transmitting plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible hangers. Hangers shall be at least No. 12 steel-wire gage (0.106 inch) galvanized wire or equivalent.

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**Exception:** Light-transmitting plastic diffusers used in suspended acoustical ceiling systems shall conform with the support requirements as set forth in Section 803.9.

**2606.7.2 Installation.** Light-transmitting plastic diffusers shall comply with Chapter 8 unless the light-transmitting plastic diffusers will fall from the mountings before igniting, at an ambient temperature of at least 200°F (111°C) below the ignition temperature of the panels. The panels shall remain in place at an ambient room temperature of 175°F (79°C) for a period of not less than 15 minutes.

**2606.7.3 Size limitations.** Individual panels or units shall not exceed 10 feet (3048 mm) in length nor 30 square feet (2.79 m<sup>2</sup>) in area.

**2606.7.4 Fire suppression system.** In buildings that are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, plastic light-diffusing systems shall be protected both above and below unless the sprinkler system has been specifically approved for installation only above the light-diffusing system. Areas of light-diffusing systems that are protected in accordance with this section shall not be limited.

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**2606.7.5 Electrical luminaires.** Light-transmitting plastic panels and light-diffuser panels that are installed in approved electrical luminaires shall comply with the requirements of Chapter 8 unless the light-transmitting plastic panels conform to the requirements of Section 2606.7.2.

**2606.8 Partitions.** Light-transmitting plastics used in or as partitions shall comply with the requirements of Chapters 6 and 8.

**2606.9 Bathroom accessories.** Light-transmitting plastics shall be permitted as glazing in shower stalls, shower doors, bathtub enclosures and similar accessory units. Safety glazing shall be provided in accordance with Chapter 24.

**NYC 2606.10 Awnings, patio covers and similar structures.** Awnings constructed of light-transmitting plastics shall be constructed in accordance with provisions specified in Sec-

tion 3105 and Chapter 32 for projections. Patio covers constructed of light-transmitting plastics shall comply with Section 2606. Light-transmitting plastics used in canopies at motor fuel-dispensing facilities shall comply with Section 2606 except as modified by Section 406.5.3.

**2606.11 Greenhouses.** Light-transmitting plastics shall be permitted in lieu of plain glass in greenhouses.

**2606.12 Solar collectors.** Light-transmitting plastic covers on solar collectors having noncombustible sides and bottoms shall be permitted on buildings not over three stories above grade plane or 9,000 square feet (836.1 m<sup>2</sup>) in total floor area, provided the light-transmitting plastic cover does not exceed 33.33 percent of the roof area for CC1 materials or 25 percent of the roof area for CC2 materials.

**Exception:** Light-transmitting plastic covers having a thickness of 0.010 inch (0.3 mm) or less or shall be permitted to be of any plastic material provided the area of the solar collectors does not exceed 33.33 percent of the roof area.

## SECTION BC 2607 LIGHT-TRANSMITTING PLASTIC WALL PANELS

**2607.1 General.** Light-transmitting plastics shall be permitted to be used as wall panels in exterior walls, provided that the walls are not required to have a fire-resistance rating and the installation conforms to the requirements of this section. Such panels shall be erected and anchored on a foundation, waterproofed or otherwise protected from moisture absorption and sealed with a coat of mastic or other approved waterproof coating. Light-transmitting plastic wall panels shall also comply with Section 2606.

**Exception:** Light-transmitting plastics shall not be used as wall panels in exterior walls in occupancies in Groups A-1, A-2, H, I-2 and I-3.

**2607.2 Installation.** Exterior wall panels installed as provided for herein shall not alter the type of construction classification of the building.

**2607.3 Height limitation.** Light-transmitting plastics shall not be installed more than 75 feet (22 860 mm) above grade plane, except as allowed by Section 2607.5.

**2607.4 Area limitation and separation.** The maximum area of a single wall panel and minimum vertical and horizontal separation requirements for exterior light-transmitting plastic wall panels shall be as provided for in Table 2607.4. The maximum percentage of wall area of any story in light-transmitting plastic wall panels shall not exceed that indicated in Table 2607.4 or the percentage of unprotected openings permitted by Section 705.8, whichever is smaller.

### Exceptions:

1. In structures provided with approved flame barriers extending 30 inches (760 mm) beyond the exterior wall in the plane of the floor, a vertical separation is not required at the floor except that provided by the vertical thickness of the flame barrier projection.

**TABLE 2607.4  
AREA LIMITATION AND SEPARATION REQUIREMENTS FOR  
LIGHT-TRANSMITTING PLASTIC WALL PANELS<sup>a</sup>**

FIRE SEPARATION DISTANCE (feet)	CLASS OF PLASTIC	MAXIMUM PERCENTAGE AREA OF EXTERIOR WALL IN PLASTIC WALL PANELS	MAXIMUM SINGLE AREA OF PLASTIC WALL PANELS (square feet)	MINIMUM SEPARATION OF PLASTIC WALL PANELS (feet)	
				Vertical	Horizontal
Less than 6	—	Not Permitted	Not Permitted	—	—
6 or more but less than 11	CC1	10	50	8	4
	CC2	Not Permitted	Not Permitted	—	—
11 or more but less than or equal to 30	CC1	25	90	6	4
	CC2	15	70	8	4
Over 30	CC1	50	Not Limited	3 <sup>b</sup>	0
	CC2	50	100	6 <sup>b</sup>	3

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>.

a. For combinations of plastic glazing and plastic wall panel areas permitted, see Section 2607.6.

b. For reductions in vertical separation allowed, see Section 2607.4.

- Veneers of approved weather-resistant light-transmitting plastics used as exterior siding in buildings of Type V construction in compliance with Section 1406.

- The area of light-transmitting plastic wall panels in exterior walls of greenhouses shall be exempt from the area limitations of Table 2607.4 but shall be limited as required for unprotected openings in accordance with Section 705.8.

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**2607.5 Automatic sprinkler system.** Where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, the maximum percentage area of exterior wall in any story in light-transmitting plastic wall panels and the maximum square footage of a single area given in Table 2607.4 shall be increased 100 percent, but the area of light-transmitting plastic wall panels shall not exceed 50 percent of the wall area in any story, or the area permitted by Section 705.8 for unprotected openings, whichever is smaller. These installations shall be exempt from height limitations.

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**2607.6 Combinations of glazing and wall panels.** Combinations of light-transmitting plastic glazing and light-transmitting plastic wall panels shall be subject to the area, height and percentage limitations and the separation requirements applicable to the class of light-transmitting plastic as prescribed for light-transmitting plastic wall panel installations.

## SECTION BC 2608 LIGHT-TRANSMITTING PLASTIC GLAZING

**2608.1 Buildings of Type VB construction.** Openings in the exterior walls of buildings of Type VB construction, where not required to be protected by Section 705, shall be permitted to be glazed or equipped with light-transmitting plastic. Light-transmitting plastic glazing shall also comply with Section 2606.

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**2608.2 Buildings of other types of construction.** Openings in the exterior walls of buildings of types of construction other than Type VB, where not required to be protected by Section 705, shall be permitted to be glazed or equipped with light-transmitting plastic in accordance with Section 2606 and all of the following:

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- The aggregate area of light-transmitting plastic glazing shall not exceed 25 percent of the area of any wall face of the story in which it is installed. The area of a single pane of glazing installed above the first story above grade plane shall not exceed 16 square feet (1.5 m<sup>2</sup>) and the vertical dimension of a single pane shall not exceed 4 feet (1219 mm).

**Exception:** Where an automatic sprinkler system is provided throughout in accordance with Section 903.3.1.1, the area of allowable glazing shall be increased to a maximum of 50 percent of the wall face of the story in which it is installed with no limit on the maximum dimension or area of a single pane of glazing.

- Approved flame barriers extending 30 inches (762 mm) beyond the exterior wall in the plane of the floor, or approved vertical panels not less than 4 feet (1219 mm) in height, shall be installed between glazed units located in adjacent stories.

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**Exception:** Approved vertical panels not less than 3 feet (914 mm) in height or flame barriers extending 30 inches (762 mm) beyond the exterior wall shall be installed between glazed units located in adjacent stories in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

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- Light-transmitting plastics shall not be installed more than 75 feet (22 860 mm) above grade level.

**Exception:** Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

## SECTION BC 2609 LIGHT-TRANSMITTING PLASTIC ROOF PANELS

**2609.1 General.** Light-transmitting plastic roof panels shall comply with this section and Section 2606. Light-transmitting plastic roof panels shall not be installed in Groups H, I-2 and I-3. In all other groups, light-transmitting plastic roof panels shall comply with any one of the following conditions:

1. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. The roof construction is not required to have a fire-resistance rating by Table 601.
3. The roof panels meet the requirements for roof coverings in accordance with Chapter 15.

**2609.2 Separation.** Individual roof panels shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane.

### Exceptions:

1. The separation between roof panels is not required in a building equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. The separation between roof panels is not required in low-hazard occupancy buildings complying with the conditions of Section 2609.4, Exception 2 or 3.

**2609.3 Location.** Where exterior wall openings are required to be protected by Section 705.8, a roof panel shall not be installed within 6 feet (1829 mm) of such exterior wall.

**2609.4 Area limitations.** Roof panels shall be limited in area and the aggregate area of panels shall be limited by a percentage of the floor area of the room or space sheltered in accordance with Table 2609.4.

### Exceptions:

1. The area limitations of Table 2609.4 shall be permitted to be increased by 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. Low-hazard occupancy buildings, such as swimming pool shelters, shall be exempt from the area limitations of Table 2609.4, provided that the buildings do not exceed 5,000 square feet (465 m<sup>2</sup>) in area and have a minimum fire separation distance of 10 feet (3048 mm).
3. Greenhouses that are occupied for growing plants on a production or research basis, without public access, shall be exempt from the area limitations of Table 2609.4 provided they have a minimum fire separation distance of 4 feet (1219 mm).
4. Roof coverings over terraces and patios in Group R-3 occupancies shall be exempt from the area limitations of Table 2609.4.

TABLE 2609.4  
AREA LIMITATIONS FOR LIGHT-TRANSMITTING  
PLASTIC ROOF PANELS

CLASS OF PLASTIC	MAXIMUM AREA OF INDIVIDUAL ROOF PANELS (square feet)	MAXIMUM AGGREGATE AREA OF ROOF PANELS (percent of floor area)
CC1	300	30
CC2	100	25

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

## SECTION BC 2610 LIGHT-TRANSMITTING PLASTIC SKYLIGHT GLAZING

**2610.1 Light-transmitting plastic glazing of skylight assemblies.** Skylight assemblies glazed with light-transmitting plastic shall conform to the provisions of this section and Section 2606. Unit skylights glazed with light-transmitting plastic shall also comply with Section 2405.5.

**Exception:** Skylights in which the light-transmitting plastic conforms to the required roof-covering class in accordance with Section 1505.

**2610.2 Mounting.** The light-transmitting plastic shall be mounted above the plane of the roof on a curb constructed in accordance with the requirements for the type of construction classification, but at least 4 inches (102 mm) above the plane of the roof. Edges of light-transmitting plastic skylights or domes shall be protected by metal or other approved noncombustible material, or the light-transmitting plastic dome or skylight shall be shown to be able to resist ignition where exposed at the edge to a flame from a Class B brand as described in ASTM E 108 or UL 790.

### Exceptions:

1. Curbs shall not be required for skylights used on roofs having a minimum slope of three units vertical in 12 units horizontal (25-percent slope) in occupancies in Group R-3 and on buildings with a nonclassified roof covering.
2. The metal or noncombustible edge material is not required where nonclassified roof coverings are permitted.

**2610.3 Slope.** Flat or corrugated light-transmitting plastic skylights shall slope at least four units vertical in 12 units horizontal (4:12). Dome-shaped skylights shall rise above the mounting flange a minimum distance equal to 10 percent of the maximum span of the dome but not less than 3 inches (76 mm).

**Exception:** Skylights that pass the Class B Burning Brand Test specified in ASTM E 108 or UL 790 shall have no minimum slope requirement.

**2610.4 Maximum area of skylights.** Each skylight shall have a maximum area within the curb of 100 square feet (9.3 m<sup>2</sup>).

**Exception:** The area limitation shall not apply where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or the

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building is equipped with smoke and heat vents in accordance with Section 910.

**2610.5 Aggregate area of skylights.** The aggregate area of skylights shall not exceed  $33\frac{1}{3}$  percent of the floor area of the room or space sheltered by the roof in which such skylights are installed where Class CC1 materials are utilized, and 25 percent where Class CC2 materials are utilized.

**Exception:** The aggregate area limitations of light-transmitting plastic skylights shall be increased 100 percent beyond the limitations set forth in this section where the building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 or the building is equipped with smoke and heat vents in accordance with Section 910.

**2610.6 Separation.** Skylights shall be separated from each other by a distance of not less than 4 feet (1219 mm) measured in a horizontal plane.

**Exceptions:**

1. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
2. In Group R-3, multiple skylights located above the same room or space with a combined area not exceeding the limits set forth in Section 2610.4.

**2610.7 Location.** Where exterior wall openings are required to be protected in accordance with Section 705, a skylight shall not be installed within 6 feet (1829 mm) of such exterior wall.

**2610.8 Combinations of roof panels and skylights.** Combinations of light-transmitting plastic roof panels and skylights shall be subject to the area and percentage limitations and separation requirements of Section 2609 applicable to roof panel installations.

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## SECTION BC 2611

### LIGHT-TRANSMITTING PLASTIC INTERIOR SIGNS

**2611.1 General.** Light-transmitting plastic interior wall signs shall be limited as specified in Sections 2611.2 through 2611.4. Light-transmitting plastic interior wall signs in covered mall buildings shall comply with Section 402.16. Light-transmitting plastic interior signs shall also comply with Section 2606.

**2611.2 Aggregate area.** The sign shall not exceed 20 percent of the wall area.

**2611.3 Maximum area.** The sign shall not exceed 24 square feet (2.2 m<sup>2</sup>).

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**2611.4 Encasement.** Edges and backs of the sign shall be fully encased in metal.

## SECTION BC† 2612

### FIBER REINFORCED POLYMER AND FIBERGLASS REINFORCED POLYMER†

**2612.1 General.** The provisions of this section shall govern the requirements and uses of fiber reinforced polymer or

fiberglass reinforced polymer in and on buildings and structures.

**2612.2 Labeling and identification.** Packages and containers of fiber reinforced polymer or fiberglass reinforced polymer and their components delivered to the job site shall bear the label of an approved agency showing the manufacturer's name, product listing, product identification and information sufficient to determine that the end use will comply with the code requirements.

**2612.3 Interior finish.** Fiber reinforced polymer or fiberglass reinforced polymer used as interior finish shall comply with Chapter 8.

**2612.4 Decorative materials and trim.** Fiber reinforced polymer or fiberglass reinforced polymer used as decorative materials or trim shall comply with Section 806.

**2612.5 Light-transmitting materials.** Fiber reinforced polymer or fiberglass reinforced polymer used as light-transmitting materials shall comply with Sections 2606 through 2611 as required for the specific application.

**2612.6 Exterior use.** Fiber reinforced polymer or fiberglass reinforced polymer shall be permitted to be installed on the exterior walls of buildings of any type of construction when such polymers meet the requirements of Section 2603.5 and is fireblocked in accordance with Section 717. The fiber reinforced polymer or the fiberglass reinforced polymer shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads, wind loads and earthquake loads as specified in Sections 1608, 1609 and 1613, respectively.

**Exceptions:**

1. When all of the following conditions are met:
  - 1.1. When the area of the fiber reinforced polymer or the fiberglass reinforced polymer does not exceed 20 percent of the respective wall area, the fiber reinforced polymer or the fiberglass reinforced polymer shall have a flame spread index of 25 or less or when the area of the fiber reinforced polymer or the fiberglass reinforced polymer does not exceed 10 percent of the respective wall area, the fiber reinforced polymer or the fiberglass reinforced polymer shall have a flame spread index of 75 or less. The flame spread index requirement shall not be required for coatings or paints having a thickness of less than 0.036 inch (0.9 mm) that are applied directly to the surface of the fiber reinforced polymer or the fiberglass reinforced polymer.
  - 1.2. Fireblocking complying with Section 717.2.6 shall be installed.
  - 1.3. The fiber reinforced polymer or the fiberglass reinforced polymer shall be installed directly to a noncombustible substrate or be separated from the exterior wall by one of the following materials: corrosion-resistant steel having a minimum base metal thickness of 0.016 inch (0.41 mm) at any point, aluminum having a



minimum thickness of 0.019 inch (0.5 mm) or other approved noncombustible material.

- 1.4. The fiber reinforced polymer or the fiberglass reinforced polymer shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads, wind loads and earthquake loads as specified in Sections 1608, 1609 and 1613, respectively.
2. When installed on buildings that are 40 feet (12 190 mm) or less above grade, the fiber reinforced polymer or the fiberglass reinforced polymer shall meet the requirements of Section 1406.2 and shall comply with all of the following conditions:
  - 2.1. Where the fire separation distance is 5 feet (1524 mm) or less, the area of the fiber reinforced polymer or the fiberglass reinforced polymer shall not exceed 10 percent of the wall area. Where the fire separation distance is greater than 5 feet (1524 mm), there shall be no limit on the area of the exterior wall coverage using fiber reinforced polymer or the fiberglass reinforced polymer.
  - 2.2. The fiber reinforced polymer or the fiberglass reinforced polymer shall have a flame spread index of 200 or less. The flame spread index requirement shall not be required for coatings or paints having a thickness of less than 0.036 inch (0.9 mm) that are applied directly to the surface of the fiber reinforced polymer or the fiberglass reinforced polymer.
  - 2.3. Fireblocking complying with Section 717.2.6 shall be installed.
  - 2.4. The fiber reinforced polymer or the fiberglass reinforced polymer shall be designed for uniform live loads as required in Table 1607.1 as well as for snow loads, wind loads and earthquake loads as specified in Sections 1608, 1609 and 1613, respectively.

## SECTION BC $\pm$ 2613 REFLECTIVE PLASTIC CORE INSULATION

**2613.1 General.** The provisions of this section shall govern the requirements and uses of reflective plastic core insulation in buildings and structures. Reflective plastic core insulation shall comply with the requirements of Section 2613.2 and of one of the following: Section 2613.3 or 2613.4.

**2613.2 Identification.** Packages and containers of reflective plastic core insulation delivered to the job site shall show the manufacturer's or supplier's name, product identification and information sufficient to determine that the end use will comply with the code requirements.

**2613.3 Surface-burning characteristics.** Reflective plastic core insulation shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450 when tested in accordance with ASTM E 84 or UL 723. The reflective plastic core insulation shall be tested at the maxi-

mum thickness intended for use and shall be tested using one of the mounting methods in Section 2613.3.1 or 2613.3.2.

**2613.3.1 Mounting of test specimen.** The test specimen shall be mounted on 2-inch-high (51 mm) metal frames so as to create an air space between the unexposed face of the reflective plastic core insulation and the lid of the test apparatus.

**2613.3.2 Specific testing.** A set of specimen preparation and mounting procedures shall be used which are specific to the testing of reflective plastic core insulation.

**2613.4 Room corner test heat release.** Reflective plastic core insulation shall comply with the acceptance criteria of Section 803.1.2.1 of this code when tested in accordance with NFPA 286 or UL 1715 in the manner intended for use and at the maximum thickness intended for use.

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## CHAPTER 27

# ELECTRICAL

### SECTION BC 2701 GENERAL

**2701.1 Scope.** This chapter governs the electrical components, equipment and systems used in buildings and structures covered by this code. Electrical components, equipment and systems shall be designed and constructed in accordance with the provisions of the *New York City Electrical Code*.

### SECTION BC 2702 EMERGENCY AND STANDBY POWER SYSTEMS

**2702.1 Installation.** Emergency and standby power systems shall be installed in accordance with the *New York City Electrical Code*, NFPA 110 and NFPA 111.

**2702.1.1 Fuel supply.** Systems relying on fuel supplies shall have an on-premises fuel supply sufficient for not less than 6-hour full-demand operation of the system. However, natural gas from the public utility street main shall be permitted as the sole fuel supply for (i) emergency power systems serving R-2 occupancies and (ii) standby power systems, provided that an outside gas cut-off valve separate from other gas services is installed in accordance with Section E.6 of Appendix E of the *New York City Fuel Gas Code*.

**2702.1.2 Stationary generators.** Stationary emergency and standby power generators shall be listed in accordance with UL 2200 and shall comply with Sections 2702.1.2.1 through 2702.1.2.3.

**2702.1.2.1 Prohibited location.** Emergency and standby power generators shall not be located in the same room as the main or primary electrical service equipment. Distribution associated with emergency and standby power systems shall not pass through the room containing the main or primary electrical service equipment.

**2702.1.2.2 Enclosure.** Emergency and standby generators within a building shall be located within a dedicated room separated by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**2702.1.2.2.1 Generator room contents.** Equipment and fuel tanks located within the emergency generator room shall be limited to equipment and fuel tanks associated with the emergency and standby power systems. Piping within the room shall be limited to sprinkler piping.

#### Exceptions:

1. Uninterrupted conduits not associated with the emergency and standby power

system may pass through the emergency generator room.

2. Piping associated with generator cooling systems may be located within the emergency generator room.

**2702.1.2.3 Multiple generators.** Multiple generators supplying emergency power system loads only, or supplying emergency power system equipment in combination with optional standby loads as a common system, may share common fuel supplies and other common equipment and systems.

**2702.1.3 Capacity.** The emergency and standby power systems shall have capacity and ratings that supply all equipment required to be operational at the same time.

**2702.1.4 Protection of fire pumps.** Where electrically powered fire pumps are connected to the emergency power system, overcurrent protection and feeder conductors shall be provided in accordance with the *New York City Electrical Code*. Automatic transfer switches shall be located in the same room as the fire pump as an integral part of the pump controller.

**2702.1.5 Special inspection.** The installation of a required emergency or standby power system shall be subject to special inspection in accordance with Section 1704.

**2702.1.6 Registration.** Fuel-burning equipment for an emergency or standby power system shall be registered with the Department of Environmental Protection in accordance with the requirements of Section 24-109 of the *Administrative Code*.

**2702.1.7 Automatic transfer devices and power system feeders.** Automatic transfer devices, emergency generators and emergency or standby power system feeders shall comply with Sections 2702.1.7.1 through 2707.1.7.2.1.

**2702.1.7.1 Prohibited location.** All automatic transfer devices and emergency power system feeders that serve required emergency power system equipment shall not be located in the same room as the emergency power system equipment or the main or primary electrical service equipment.

**2702.1.7.2 Enclosure.** Any automatic transfer device that is not located at the load shall be located within a dedicated room separated by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both.

**2702.1.7.2.1 Automatic transfer device room.** Equipment located within the automatic transfer device room shall be limited to equipment associated with the emergency or standby power systems. Piping within the room shall be limited to sprinkler piping.

**2702.2 Where required.** Emergency and standby power systems shall be provided where required by this section.

**2702.2.1 Group A occupancies.** Emergency power shall be provided for voice/alarm communication systems in Group A occupancies in accordance with Section 907.5.2.2.4.

**2702.2.2 Smoke control systems.** Standby power shall be provided for smoke control systems in accordance with Section 909.11.

**2702.2.3 Exit signs.** Emergency power shall be provided for exit signs in accordance with Section 1011.5.3.

**2702.2.4 Means of egress illumination.** Emergency power shall be provided for means of egress illumination in accordance with Section 1006.3.

**2702.2.5 Accessible means of egress elevators.** Standby power shall be provided for elevators that are part of an accessible means of egress in accordance with Section 1007.4.



**2702.2.6 Horizontal sliding doors.** Standby power shall be provided for horizontal sliding doors in accordance with Section 1008.1.4.3.

**2702.2.7 Semiconductor fabrication facilities.** Emergency power shall be provided for semiconductor fabrication facilities in accordance with Section 415.8.10.

**2702.2.8 Membrane structures.** Standby power shall be provided for auxiliary inflation systems in accordance with Section 3102.8.2. Emergency power shall be provided for exit signs in tents and membrane structures.

**2702.2.9 Hazardous materials.** Emergency or standby power shall be provided in occupancies with hazardous materials in accordance with Section 414.5.4 and the *New York City Fire Code*.

**2702.2.10 Highly toxic and toxic materials.** Emergency power shall be provided for occupancies with highly toxic or toxic materials in accordance with the *New York City Fire Code*.

**2702.2.11 Organic peroxides.** Standby power shall be provided for occupancies with organic peroxides in accordance with the *New York City Fire Code*.

**2702.2.12 Pyrophoric materials.** Emergency power shall be provided for occupancies with silane gas in accordance with the *New York City Fire Code*.

**2702.2.13 Covered mall buildings.** Standby power shall be provided for voice/alarm communication systems in covered mall buildings in accordance with Section 402.14.

**2702.2.14 High-rise buildings.** Emergency and standby power shall be provided in high-rise buildings in accordance with Sections 403.4.7 and 403.4.8.

**2702.2.15 Underground buildings.** Emergency and standby power shall be provided in underground buildings in accordance with Sections 405.8 and 405.9.

**2702.2.16 Group I-3 occupancies.** Emergency power shall be provided for doors in Group I-3 occupancies in accordance with Section 408.4.2.

**2702.2.17 Elevators.** Standby power for elevators, including elevators provided to accommodate ambulance stretchers pursuant to Section 3002.4, shall be provided as set forth in Section 3003.1. Controls, elevator cab light, ventilation and associated equipment required for elevator operation shall be connected to emergency power.

**2702.2.18 Airport traffic control towers.** Standby power shall be provided in airport traffic control towers in accordance with Section 412.3.5.

**2702.2.19 Smokeproof enclosures and pressurized elevator shafts†.** Standby power shall be provided for smokeproof enclosures as required by Section 909.20.6.2 and for pressurized elevator shafts provided in accordance with Section 708.14.2.5.

**2702.2.20 Occupancy Groups B, E and R-1.** Emergency and standby power shall be required in those Group B, E and R-1 occupancies specified in this section:

1. Group B occupancies with occupied floor less than 75 feet (22 860 mm) above the lowest fire department vehicle access having a gross floor area over 15,000 square feet (1393.6 m<sup>2</sup>) per floor or a total gross floor area of 100,000 square feet (9290.3 m<sup>2</sup>) or more.
2. Group E occupancies with occupied floor less than 75 feet (22 860 mm) above the lowest level of Fire Department vehicle access having a gross floor area over 15,000 square feet (1393.6 m<sup>2</sup>) per floor or a total gross floor area of 100,000 square feet (9290.3 m<sup>2</sup>) or more.
3. All Group R-1 occupancies.

**2702.2.20.1 Equipment requiring emergency power system.** With respect to such Occupancy Groups B, E and R-1, the following equipment, where such equipment is required by this code, shall be provided with an emergency power system:

1. Exit signs and means of egress illumination required by Chapter 10;
2. Elevator car lighting;
3. Emergency voice/alarm communications systems, including Fire Department in-building Auxiliary Radio Communication systems (ARCs) provided where required or installed voluntarily in accordance with Section 917;
4. Automatic fire detection systems;
5. Fire alarm systems; and
6. Electrically powered fire pumps, including manual fire pumps, automatic fire pumps and sprinkler booster pumps.

**2702.2.20.2 Equipment requiring standby power system.** With respect to such Occupancy Groups B, E and R-1, the following equipment, where such equip-

ment is required by this code, shall be provided with a standby power system:

1. Ventilating systems used for smoke venting or control;
2. Stair pressurization; and
3. At least three elevators in a building at one time with manual transfer to other elevators as required by Section 3003.
4. Power and lighting for the fire command center required by Section 403.4.5.

**2702.3 Maintenance.** Emergency and standby power systems shall be maintained and tested in accordance with the *New York City Fire Code* and *New York City Electrical Code*.

**2702.4 Required loads for optional standby power systems.** In addition to any other loads, optional standby power systems shall be capable of providing power to the following systems upon failure of the normal power supply or the emergency or standby power system:

1. Emergency lighting;
2. Fire alarm systems; and
3. Elevators as follows:
  - 3.1. For Group R-2 occupancies in buildings greater than 125 feet (38 100 mm) in height, at least one elevator serving all floors, or one elevator per bank where different banks serve different portions of the building; or
  - 3.2. For all other buildings having occupied floors located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, at least one elevator that serves all floors.





## CHAPTER 28

# MECHANICAL SYSTEMS

### SECTION BC 2801 GENERAL

**2801.1 Scope.** Mechanical appliances, equipment and systems shall be constructed, installed and maintained in accordance with the *New York City Mechanical Code* and the *New York City Fuel Gas Code*. Masonry chimneys, fireplaces and barbecues shall comply with the *New York City Mechanical Code* and Chapter 21 of this code.




## CHAPTER 29

# PLUMBING SYSTEMS

### SECTION BC 2901 GENERAL

**NYC** | **2901.1 Scope.** The *New York City Plumbing Code* shall govern the construction, erection, installation, alteration, repairs, relocation, replacement, addition to, use or maintenance of plumbing equipment and systems.

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## CHAPTER 30

# ELEVATORS AND CONVEYING SYSTEMS

### SECTION BC 3001 GENERAL

**3001.1 Scope.** This chapter establishes the minimum safety requirements for and governs the design, construction, installation, alteration, maintenance, inspection, test and operation of elevators, dumbwaiters, escalators, moving walks, industrial lifts and loading ramps, mechanical parking equipment, console or stage lifts, power-operated scaffolds, amusement devices, and special hoisting and conveying equipment. This chapter and all the provisions of this code for new installations shall also apply to elevators in existing buildings moved to new hoistways. High-rise building elevators shall also conform to the provisions of Section 403 of this code.

**Exception:** Personnel and material hoists used for construction operations subject to the requirements of Chapter 33.

**3001.2 Referenced standards.** Except as otherwise provided for in this code, the design, construction, installation, alteration, repair and maintenance of elevators and other conveying systems and their components shall conform to ASME A17.1 as modified by Appendix K, Chapter K1, ASME A17.2, ASME A18.1, ASME A17.3 as modified by Appendix K, Chapter K3, ASME A17.5, ASME A17.1S as modified by Appendix K, Chapter K4, ASME A90.1, ASME B20.1 as modified by Appendix K, Chapter K2, ALI ALCTV, and for construction in areas of special flood hazard, Appendix G.

**3001.3 Accessibility.** The following elevators and lifts shall conform to ICC A117.1:

1. Passenger elevators, including destination-oriented elevators, required to be accessible by Chapter 11;
2. Limited-Use/Limited-Application (LULA) elevators permitted to be installed on an accessible route pursuant to Section 1109.6.1;
3. Platform lifts permitted to be installed on an accessible route pursuant to Section 1109.7; and
4. Private residence elevators serving within an individual dwelling unit in Groups R-2 and R-3 occupancies on an accessible route.

**3001.4 Change in use.** A change in use of an elevator from freight to passenger, passenger to freight, or from one freight class to another freight class shall comply with Section 8.7 of ASME A17.1.

**3001.5 Piping or ductwork.** No piping or ductwork of any kind shall be permitted within hoistway or elevator enclosures except:

1. As required for the elevator installation; and
2. Low-voltage wiring less than 50 volts required for fire alarm systems required by this code.

**3001.6 Elevator mirrors.** A mirror shall be installed in each self-service passenger elevator in multiple dwellings. Such mirror shall be affixed and maintained in a manner sufficient to enable persons entering such elevator to view the inside thereof prior to entry to determine whether any person is in the elevator.

**3001.7 Car switch operation.** Elevators with car switch operation (manual operation) shall be provided with a signal system by means of which signals can be given from any landing whenever the elevator is desired at that landing.

**3001.8 Prohibited devices.** The following devices shall be prohibited:

**3001.8.1 Manlifts.** The installation of manlifts is prohibited.

**3001.8.2 Sidewalk elevators.** The installation of sidewalk elevators located outside the street line is prohibited.

**3001.9 Approved equipment.** All equipment listed in ASME A17.1<sup>†</sup>, Section 8.3 as modified by *New York City Building Code*, Appendix K, Chapter K1, shall be approved by the commissioner.

**3001.10 Construction documents.** Applications for elevator, escalator, moving walkway and stairway, dumbwaiter, and similar equipment shall contain construction documents that include the following:

1. The location of all machinery, switchboards, junction boxes, and reaction points, with loads indicated;
2. The details of all hoistway conditions including bracket spacing;
3. The estimated maximum vertical forces on the guide rails on application of the safety device;
4. In the case of freight elevators for Class B or C loading, the horizontal forces on the guide-rail faces during loading and unloading; and the estimated maximum horizontal forces in a postwise direction on the guide-rail faces on application of the safety device;
5. The size and weight per foot of any rail reinforcements where provided;
6. Compliance with the accessibility features of this code;
7. The details of capability of the withstanding forces (impact) on door entrance assembly and retaining devices;
8. The withstanding hourly fire rating of the hoistway and the hoistway door assembly;
9. The impact loads imposed on machinery and sheave beams, supports and floors or foundations;

10. The impact load on buffer supports due to buffer engagement at the maximum permissible speed and load;
11. Where compensation tie down is applied, the load on the compensation tie down supports; and
12. The total static and dynamic loads from the governor, buffer and tension system.

**3001.11 Special provisions for prior code buildings.** Prior code buildings shall be permitted to comply with Section 3001.11.1.

**3001.11.1 Existing shafts.** Elevator cabs installed in existing shafts shall be permitted to be smaller than that required by this chapter where necessary to fit in the existing shaft, unless a larger cab size is otherwise mandated pursuant to Section 1101.3.

## SECTION BC 3002 HOISTWAY ENCLOSURES

**3002.1 Hoistway enclosure protection.** Elevator, dumbwaiter and other hoistway enclosures shall be shaft enclosures complying with Section 708.4.

**3002.1.1 Opening protectives.** Openings in hoistway enclosures shall be protected as required in Chapter 7.

**Exception:** The elevator car doors and the associated hoistway enclosure doors at the floor level designated for recall in accordance with Section 3003.2 shall be permitted to remain open during Phase I Emergency Recall Operation in accordance with ASME A17.1, as modified by Appendix K, Chapter K1.

**3002.1.2 Hardware.** Hardware on opening protectives shall be of an approved type installed as tested, except that approved interlocks, mechanical locks and electric contacts, door and gate electric contacts and door-operating mechanisms shall be exempt from the fire test requirements.

**3002.2 Number of elevator cars in a hoistway.** Where four or more elevator cars serve all or the same portion of a building, the elevators shall be located in at least two separate hoistways. Not more than four elevator cars shall be located in any single hoistway enclosure. Elevators that service different risers shall be located in separate hoistways.

**3002.3 Emergency signs.** A sign shall be posted and maintained on every floor at the elevator landing. The sign shall read—"IN FIRE EMERGENCY, DO NOT USE ELEVATOR. USE THE EXIT STAIRS." The lettering shall be at least  $\frac{1}{2}$  (13 mm) inch block letters in red with white background or as otherwise approved by the commissioner. Such lettering shall be properly spaced to provide good legibility. The sign shall also contain a diagram showing the location where it is posted and the location and letter identification of the stairs on the floor. The sign shall be at least 10 inches by 12 inches (255 mm by 305 mm), located directly above a call button and securely attached to the wall or partition. The top of such sign shall be above 6 feet (1829 mm) from the floor level. The diagram on such sign may be omitted pro-

vided that signs containing such diagram are posted in conspicuous places on the respective floor. In such case, the sign at the elevator landing shall be at least  $2\frac{1}{2}$  inches by 10 inches (64 by 254 mm) and the diagram signs shall be at least eight inches by twelve inches (304 mm).

**3002.3.1 Stair and elevator identification signs.** Each stair and each bank of elevators shall be identified by an alphabetic letter. A sign indicating the letter of identification for the elevator bank shall be posted and maintained at each elevator landing directly above or as part of the sign specified in Section 3002.3. The stair identification sign shall be posted and maintained on the occupancy side of the stair door. The letter on the sign shall be at least 3 inches (76 mm) high, of bold type and of contrasting color from the background. Such signs shall be securely attached.

### Exceptions:

1. The emergency sign shall not be required for elevators that are part of an accessible means of egress complying with Section 1007.4.
2. The emergency sign shall not be required for elevators that are used for occupant self-evacuation in accordance with Section 3008.

**3002.4 Elevator required.** In buildings five stories in height or more, at least one elevator shall provide access to all floors.

**3002.4.1 Standby power required for elevators.** Standby power shall be provided to elevators in the following categories:

1. Elevator(s) in high-rise buildings covered by Section 403.1, other than R-2 occupancies, as required by Section 403.4.8.1;
2. Elevator(s) in high-rise buildings in R-2 occupancies more than 125 feet (38 100 mm) in height, as required by Section 403.4.8.2;
3. Elevator(s) in underground buildings, as required by Section 405.4.3;
4. Elevator(s) in Groups B, E, and R-1 occupancies that are subject to Section 2702.2.20; and
5. Elevator(s) serving as accessible means of egress pursuant to Section 1007.4.

**3002.4.2 Elevator car to accommodate ambulance stretcher.** Where elevators are provided in buildings five stories in height or more, or underground buildings as described in Section 405.1, at least one elevator subject to Section 3003.3 shall be provided with an elevator car of such a size and arrangement to accommodate an ambulance stretcher 24-inches by 84 inches (610 mm by 2134 mm), with not less than 5-inch (127 mm) radius corners, in the horizontal, open position and shall be identified by the international symbol for emergency medical services (star of life). The symbol shall not be less than 3 inches (76 mm) high and shall be placed on both jambs of the hoistway entrances on each floor. Standby power shall

NYC be required for such an elevator if it serves a building subject to Section 3002.4.1.

**Exceptions:**

1. An elevator serving not more than one individual dwelling unit in a building, regardless of height and number of stories of such a building.
2. Limited-Use/Limited-Application (LULA) elevators (25 feet maximum rise).

**3002.5 Emergency doors.** Where an elevator is installed in a single blind hoistway or on the outside of a building, there shall be installed in the blind portion of the hoistway or blank face of the building, an emergency door in accordance with ASME A17.1.

**3002.6 Prohibited doors.**† Doors, other than hoistway doors and the elevator car door, shall be prohibited at the point of access to an elevator car unless such doors are readily openable from the car side without a key, tool, special knowledge or effort.

**3002.7 Common enclosure with stairway.** Elevators shall not be in a common shaft enclosure with a stairway.

**Exception:** Open parking garages.

**3002.8 Glass in elevator enclosures.** Glass in elevator enclosures shall comply with Section 2409.1 and ASME A17.1.

## SECTION BC 3003

### ELEVATOR EMERGENCY OPERATIONS

**3003.1 Standby power.** In buildings and structures where standby power is required or furnished to operate an elevator, the operation shall be in accordance with Sections 3002.4.1 and 3003.1.1 through 3003.1.4.

**3003.1.1 Manual transfer.** Standby power shall be manually transferable to all elevators in each bank.

**3003.1.2 One elevator.** Where only one elevator is installed, the elevator shall automatically transfer to standby power within 60 seconds after failure of normal power.

**3003.1.3 Two or more elevators.** Where two or more elevators are controlled by a common operating system, all elevators shall automatically transfer to standby power within 60 seconds after failure of normal power where the standby power source is of sufficient capacity to operate all elevators at the same time. Where the standby power source is not of sufficient capacity to operate all elevators at the same time, all elevators shall transfer to standby power in sequence, return to the designated landing and disconnect from the standby power source. After all elevators have been returned to the designated level, at least three elevators shall remain operable from the standby power source.

**3003.1.4 Venting.** Where standby power is connected to elevators, the machine room ventilation or air conditioning shall be connected to the standby power source.

**3003.2 Fire-fighters' emergency operation.** Elevators shall be provided with Phase I emergency recall operation and

Phase II emergency in-car operation in accordance with ASME A17.1 as modified by Appendix K.

**3003.3 Elevator in readiness.** Requirements for elevator in readiness shall be as defined in Sections 3003.3.1 through 3003.3.2.

**3003.3.1 Elevator in readiness for Fire Department emergency access.**† Except as provided in Section 3003.3.2, in buildings five stories in height or more, underground buildings as described in Section 405.1, and high-rise buildings, all floors shall be served by at least one elevator that shall be kept available for immediate use by the Fire Department during all hours of the night and day, including holidays, Saturdays and Sundays. There shall be available at all times a person competent to operate the elevator. However, an attendant shall not be required for buildings with occupied floors of 150 feet (45 720 mm) or less above the lowest level of the Fire Department vehicle access that have elevators with automatic or continuous pressure operation with keyed switches meeting the requirements of ASME A17.1 as modified by Appendix K so as to permit sole use of the elevators by the Fire Department.

**3003.3.2 Number of elevators.** A number of elevators shall be kept available at every floor for the sole use of the Fire Department as required by Sections 3003.3.2.1 and 3003.3.2.2. This requirement shall apply to the following types of buildings:

1. High-rise buildings with occupancies classified in Groups A, B, E, I, F, H, M and S;
2. Buildings with Group B occupancies with a gross area of 200,000 square feet (18 581 m<sup>2</sup>); and
3. Buildings with a main use or dominant occupancy in Group R-1 or R-2.

**Exception:** In buildings that are five stories or more in height but are not one of the types of buildings described in Items† 1 through 3 in Section 3003.3.2, at least one elevator car in such buildings shall be kept available for sole use by the Fire Department.

**3003.3.2.1 Three or fewer elevators.** Where a floor is serviced by three or fewer elevator cars, every car shall be kept available for sole use by the Fire Department.

**3003.3.2.2 More than three elevators.** Where a floor is serviced by more than three elevator cars, at least three elevator cars with a total rated load capacity of not less than 6,000 pounds (2722 kg) shall be kept available for the sole use of the Fire Department. Such cars shall include not more than two cars that service all floors and at least one other car in another bank servicing that floor. If the total load capacity of all cars servicing the floor is less than 6,000 pounds (2722 kg), all such cars shall be kept available for sole use of the Fire Department.

**3003.3.3 Operation and control.** Elevators that are kept for the sole use of the Fire Department and that have automatic or continuous pressure operation shall be controlled by keyed switches meeting the requirements of ASME 17.1.



**3003.3.4 Other elevator cars.** In high-rise buildings classified in Occupancy Groups A, B, E, F, H, I, M and S, in low-rise buildings classified in Occupancy Group B with a gross area of 200,000 square feet (18581 m<sup>2</sup>) or more and in buildings classified in Occupancy Group R-1 or R-2, all other automatically operated cars shall have manual operation capability.

## SECTION BC 3004 HOISTWAY VENTING

**3004.1 Reserved.**

**3004.2 Reserved.**

**3004.3 Reserved.**

**3004.4 Plumbing and mechanical systems.** Plumbing and mechanical systems shall not be located in an elevator shaft.

**Exception:** Floor drains sumps and sump pumps shall be permitted at the base of the shaft provided they are indirectly connected to the plumbing system.

**3004.5 Control of smoke and hot gases.** Hoistways of elevators shall be provided with any one of the following means to prevent the accumulation of smoke and hot gases in case of fire in accordance with Sections 3004.5.1 through 3004.5.4.

**3004.5.1 Vents in the hoistway enclosures.** Hoistway enclosures may be vented in accordance with the following:

### 1. Location of vents.

1.1. The vents in the side of the hoistway enclosure below the elevator machine room floor or in the roof of the hoistway shall open either directly to the outer air or through noncombustible ducts to the outer air.

1.2. The vents in the wall or roof of an overhead elevator machine room through the smoke hole in the top of the elevator hoistway shall be vented to the outer air through noncombustible ducts.

2. **Area of vents.** The area of vents in the hoistway or the elevator machine room and the smoke hole shall be not less than 3½ percent of the area of the hoistway nor less than 3 square feet (0.28 m<sup>2</sup>) for each elevator car, whichever is greater. Such vents shall comply with the following requirements:

2.1. **Open vents.** Of the total required vent area, not less than one-third shall be permanently open or equipped with an openable hinged damper. The smoke hole shall be permanently open.

2.2. **Closed vents.** The two-thirds closed portion of the required vent area either in the hoistway enclosure or in the elevator machine room may consist of windows or skylights glazed with annealed glass not more than ⅛-inch (3.2 mm) thick. A closed damper that opens upon the activation of a smoke detector placed at the top of the hoistway shall be considered closed.

**Exception:** The total required open vent area shall not be required to be permanently open where all of the vent openings automatically open upon detection of smoke in the elevator lobbies or hoistway, upon power failure (except when provided with a code compliant standby power supply from an approved standby power source) or upon activation of a manual override control. The manual override control shall be capable of opening and closing the vents and shall be located in an approved location.

**3004.5.2 Mechanical ventilation of the hoistway enclosure.** Hoistway enclosures may be mechanically vented. The system of mechanical ventilation shall be of sufficient capacity to exhaust at least 12 air changes per hour of the volume of such hoistways through a roof or an approved location on an exterior wall other than the lot line wall. Such system shall comply with the following requirements:

1. The smoke detector shall be placed at the top of the hoistway and shall activate the mechanical ventilation system.
2. Such mechanical ventilation system shall not pass through the overnight sleeping areas of a hotel, multiple dwelling, hospital or similar buildings.
3. Such mechanical ventilation system shall be equipped with a manual shut-off in or near the elevator control panel at the designated level.

**3004.5.3 Air pressurization of hoistway enclosure.** Hoistways may be air pressurized. Where such system is utilized, the air shall not cause erratic operation of the landing or car door equipment, traveling cables, selector tapes, governor ropes, compensating ropes, or any other components sensitive to excess movement or deflection.

**3004.5.4 Alternate means.** The commissioner may accept alternate means to prevent the accumulation of smoke and hot gases in the hoistways and machine rooms in case of fire.

## SECTION BC 3005 CONVEYING SYSTEMS

**3005.1 General.** Conveying systems shall comply with the provisions of this section.

**3005.2 Escalators and moving walks.** Escalators and moving walks shall be constructed of approved noncombustible and fire-retardant materials. This requirement shall not apply to electrical equipment, wiring, wheels, handrails and the use of ⅛-inch (0.9 mm) wood veneers on balustrades backed up with noncombustible materials.

**3005.2.1 Enclosure.** Escalator floor openings shall be enclosed with shaft enclosures complying with Section 708.†

**3005.2.2 Escalators.** Where provided in below-grade transportation stations, escalators shall have a clear width of 32 inches (813 mm) minimum.

**Exception:** The clear width is not required in existing facilities undergoing alterations.

be supported on vibration isolator pads having a minimum thickness of  $\frac{1}{2}$  inch (12.7 mm).

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**SECTION BC 3007**  
**FIRE SERVICE ACCESS ELEVATOR**

**3007.1 General.** Where required by Section 403.6.1, every floor of the building shall be served by a fire service access elevator complying with Sections 3007.1 through 3007.8. Except as modified in this section, the fire service access elevator shall be installed in accordance with this chapter and rules of the department.

**3007.2 Automatic sprinkler system.** The building shall be equipped throughout by an automatic sprinkler system in accordance with Section 903.3.1.1, except as otherwise permitted by Section 903.3.1.1.1 and as prohibited by Section 3007.2.1.

**3007.2.1 Prohibited locations.** Automatic sprinklers shall not be installed in elevator machine rooms, machinery spaces, control rooms, control spaces, and elevator hoistways of fire service access elevators.

**3007.2.2 Sprinkler system monitoring.** The sprinkler system shall have a sprinkler control valve supervisory switch and waterflow-initiating device provided for each floor that is monitored by the building's fire alarm system.

**3007.3 Water protection.** An approved method to prevent water from infiltrating into the hoistway enclosure from the operation of the automatic sprinkler system shall be provided:

1. Where an elevator lobby is provided in accordance with Section 3007.6, with respect to the automatic sprinkler system outside of the enclosed elevator lobby.

2. Where a corridor is provided in accordance with Section 3007.6, Exception 2, with respect to the automatic sprinkler system outside of the corridor and with respect to the automatic sprinklers inside the corridor that are beyond 10 feet (3048 mm) of the entrance to the hoistway enclosure of the fire service access elevator.

3. Where neither an enclosed elevator lobby nor a corridor is provided in accordance with Section 3007.6, Exception 3, with respect to the automatic sprinklers that are located beyond 10 feet (3048 mm) of the entrance to the hoistway enclosure of the fire service access elevator.

**3007.5 Hoistway enclosures.** The fire service access elevator hoistway shall be located in a shaft enclosure complying with Section 708.

**3007.5.1 Structural integrity of hoistway enclosures.** The fire service access elevator hoistway enclosure shall comply with Sections 403.2.3.1 through 403.2.3.4.

**3007.5.2 Hoistway lighting.** When firefighters' emergency operation is active, the entire height of the hoistway shall be illuminated at not less than 1 foot-candle (11 lux) as measured from the top of the car of each fire service access elevator.

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**3007.6 Fire service access elevator lobby.** The fire service access elevator shall open into a fire service access elevator lobby in accordance with Sections 3007.6.1 through 3007.6.5. Egress is permitted through the elevator lobby in accordance with Section 708.14.1.

**Exceptions:**

1. Where a fire service access elevator has two entrances onto a floor, the second entrance shall be permitted to open into an elevator lobby in accordance with Section 708.14.1.
2. A fire service access elevator lobby shall not be required on stories where the elevator opens to a corridor enclosed with a fire barrier, provided all doors opening onto such corridor are smoke and draft controlled doors complying with Section 715.4.3.1 with the UL 1784 test conducted without the artificial bottom seal.
3. A fire service access elevator lobby shall not be required on stories that are less than 3,000 square feet (279 m<sup>2</sup>) containing only R-2 occupancies.

**3007.6.1 Reserved.**

**3007.6.2 Lobby enclosure.** The fire service access elevator lobby shall be enclosed with a smoke barrier having a fire-resistance rating of not less than 1 hour, except that lobby doorways shall comply with Section 3007.6.3.

**Exception:** Enclosed fire service access elevator lobbies are not required at the levels of exit discharge.

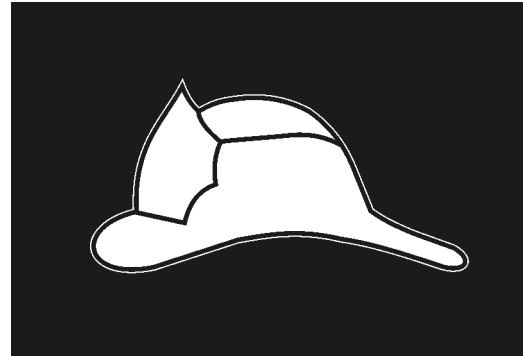
**3007.6.3 Lobby doorways.** Other than doors to the hoistway, elevator control room, or elevator control space, each doorway to a fire service access elevator lobby shall be provided with a <sup>3</sup>/<sub>4</sub>-hour fire door assembly complying with Section 715.4. The fire door assembly shall also comply with the smoke and draft control door assembly requirements of Section 715.4.3.1 with the UL 1784 test conducted without the artificial bottom seal.

**3007.6.4 Lobby size.** The enclosed fire service access elevator lobby shall be not less than 120 square feet (11 m<sup>2</sup>) in an area with a minimum dimension of 6 feet (1828 mm).

**3007.6.5 Fire service access elevator symbol.** A pictorial symbol of a standardized design designating which elevators are fire service access elevators shall be installed on each side of the hoistway door frame on the portion of the frame at right angles to the fire service access elevator lobby. The fire service access elevator symbol shall be designed as shown in Figure 3007.6.5 and shall comply with the following:

1. The fire service access elevator symbol shall be not less than 3 inches (76 mm) in height.
2. The helmet shall contrast with the background, with either a light helmet on a dark background or a dark helmet on a light background.
3. The vertical center line of the fire service access elevator symbol shall be centered on the hoistway door frame. Each symbol shall not be less than 78 inches

(1981 mm), and not more than 84 inches† (2134 mm) above the finished floor at the threshold.



**FIGURE 3007.6.5  
FIRE SERVICE ACCESS ELEVATOR SYMBOL†**

**3007.7 Elevator system monitoring.** The fire service access elevator shall be continuously monitored at the fire command center by a standard emergency service interface system meeting the requirements of NFPA 72.

**3007.8 Electrical power.** The following features serving each fire service access elevator shall be supplied by both normal power and Type 60/Class 6/Level 1 standby power:

1. Elevator equipment.
2. Elevator hoistway lighting.
3. Ventilation and cooling equipment for elevator machine/control rooms, and machinery/control spaces.
4. Elevator car lighting.

**Exception:** Standby power relying on natural gas as a fuel source need not be Class 6.

**3007.8.1 Protection of wiring or cables.** Wires or cables that are located outside of the elevator hoistway and machine room and that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, ventilation and fire-detecting systems to fire service access elevators shall be protected by construction having a fire-resistance rating of not less than 2 hours, shall be a circuit integrity cable having a fire-resistance rating of not less than 2 hours, or shall be protected by a listed electrical circuit protective system having a fire-resistance rating of not less than 2 hours.

**Exception:** Wiring and cables to control signals are not required to be protected provided that wiring and cables do not serve Phase II emergency in-car operation.

**3007.9 Reserved.**

**SECTION BC 3008  
OCCUPANT EVACUATION ELEVATORS**

**3008.1 General.** Where elevators are to be used for occupant self-evacuation during fires, all passenger elevators for general public use shall comply with Sections 3008.1 through 3008.11. Where other elevators are used for occupant self-evacuation, they shall also comply with these sections.







**3008.8 Elevator system monitoring.** The occupant evacuation elevators shall be continuously monitored at the fire command center or a central control point approved by the Fire Department and arranged to display all of the following information:

1. Floor location of each elevator car.
2. Direction of travel of each elevator car.
3. Status of each elevator car with respect to whether it is occupied.
4. Status of normal power to the elevator equipment, elevator machinery and electrical apparatus cooling equipment where provided, elevator machine room, control room and control space ventilation and cooling equipment.
5. Status of emergency or standby power system that provides backup power to the elevator equipment, elevator machinery and electrical cooling equipment where provided, elevator machine room, control room and control space ventilation and cooling equipment.
6. Activation of any fire alarm initiating device in any elevator lobby, elevator machine room, machine space containing a motor controller or electric driving machine, control space, control room or elevator hoistway.

**3008.8.1 Elevator recall.** The fire command center or an alternate location approved by the Fire Department shall be provided with the means to manually initiate a Phase I Emergency Recall of the occupant evacuation elevators in accordance with rules of the department.

**3008.9 Electrical power.** The following features serving each occupant evacuation elevator shall be supplied by both normal power and Type 60/Class 6/Level 1 standby power:

1. Elevator equipment.
2. Ventilation and cooling equipment for elevator machine/control rooms, and machinery/control spaces.
3. Elevator car lighting.

**Exceptions:**

1. Standby power relying on natural gas as a fuel source need not be Class 6.
2. Where Exception 2 of Section 403.5.2 is utilized, the standby power generating equipment need only be sized to satisfy the loads required to simultaneously operate those elevators identified in the timed egress analysis described in Exception 2.2.

**3008.9.1 Protection of wiring or cables.** Wires or cables that are located outside of the elevator hoistway, machine room, control room and control space and that provide normal or standby power, control signals, communication with the car, lighting, heating, air conditioning, ventilation and fire-detecting systems to fire service access elevators shall be protected by construction having a fire-resistance rating of not less than 2 hours, or shall be circuit integrity cable having a fire-resistance rating of not less than 2 hours, or shall be protected by a listed electrical circuit

protective system having a fire-resistance rating of not less than 2 hours.

**Exception:** Wiring and cables to control signals are not required to be protected provided that wiring and cables do not serve Phase II emergency in-car operation.

**3008.10 Emergency voice/alarm communication system.**

The building shall be provided with an emergency voice/alarm communication system. The emergency voice/alarm communication system shall be accessible to the Fire Department. The system shall be provided in accordance with Section 907.5.2.2.

**3008.10.1 Notification appliances.** No fewer than one audible and one visible notification appliance shall be installed within each occupant evacuation elevator lobby.

**3008.11 Hazardous material areas.** No building areas shall contain hazardous materials exceeding the maximum allowable quantities per control area as addressed in Section 414.2.

## SECTION BC 3009 SERVICE EQUIPMENT CERTIFICATES

**3009.1 Required.** No service equipment shall be placed in operation until a service equipment certificate of compliance has been obtained in accordance with the provisions of this code.

**3009.2 Posting of inspection certificate.** At the time a service equipment Certificate of Compliance is issued, an inspection certificate issued by the commissioner shall be posted. No such inspection certificate shall be issued for elevators that are not subject to periodic inspections pursuant to this code. The inspection certificate shall be in such form as the commissioner shall determine by rule and shall be posted in a frame with a transparent cover in the car of every passenger and freight elevator and on or near every escalator and moving walk and power-operated scaffold.

**3009.2.1 Alternate posting locations.** In lieu of posting the inspection certificate in those locations specified in this section, the inspection certificate may be kept in the on-site building manager's office. In such case, the building manager's office must be open during normal business hours. In addition, notice must be posted in each location listed in Section 3009.2 and kept in a frame with a transparent cover, or a plaque or on the car operating panel, with an indelible inscription, stating that the inspection certificate is located in the building manager's office and identifying the location of such office.

**3009.3 Temporary use certificates.** The commissioner may issue temporary use certificates for any equipment or device regulated by this code, except power-operated scaffolds, provided that such partial use and operation may be made safely and without endangering public health, safety, and welfare and provided further that such temporary use certificate shall not be issued for a period of more than 30 calendar days, subject to renewal for additional 30-day periods at the discretion of the commissioner. Temporary use certificates for elevators shall also be conditioned upon compliance with the following:

1. The class of service to be permitted shall be designated on the temporary use certificate.
2. The hoistway shall be enclosed throughout in an enclosure complying with ASME A17.1 or with a temporary enclosure in accordance with the requirements for workers' elevators (temporary elevators) of the *Industrial Code of the State of New York*, No. 23.

**3009.3.1 Posting of temporary use certificate.** The temporary use certificate shall be posted in a conspicuous location on, or adjacent to, the device covered by the certificate and shall state that the device has not been finally approved by the commissioner.

### SECTION BC 3010 ELEVATOR, AMUSEMENT AND OTHER DEVICE OPERATORS

**3010.1 Elevator operators.** With the exception of automatic operation, continuous pressure elevators and sidewalk elevators, every passenger and freight elevator with a rise of more than one story shall be in the charge of a designated competent operator, who shall be at least 18 years old and selected with consideration of his or her abilities to perform his or her duties in a careful and competent manner. Such designated competent operator shall be instructed in the safe and proper operation of the equipment.

**3010.2 Amusement device operators.** Operators of amusement devices shall meet the requirements of rules of the department.

**3010.3 Other device operators.** Other devices regulated by this code shall, when deemed necessary by the commissioner to protect public safety, be in the charge of a designated competent operator conforming to such qualifications as the commissioner may prescribe, except that operators for workers' hoists shall be assigned as required by the applicable provisions of ANSI A10.4.

**3010.4 Sanction for unlawful operation.** If the commissioner finds that any person engaged in operating an elevator, amusement, or other device is not competent to operate the elevator, amusement or other device, the owner, agent or lessee of such elevator, amusement, or other device shall, upon notice from the commissioner, discontinue the operation of such device by such operator.

### SECTION BC 3011 ELEVATOR BEING SERVICED, REPAIRED, INSPECTED OR TESTED

**3011.1 Signage.** When an existing or new automatic passenger elevator in any building or structure is being serviced, repaired, inspected or tested by an elevator company, or elevator personnel, and there are no elevator personnel available to remain in the elevator car, "CAUTION" sign tapes shall be placed across the car door jamb. One strip of "CAUTION" sign tape shall be placed at a height of 18 inches (457 mm) above the car floor and another strip of "CAUTION" sign tape shall be placed at a height of 54 inches (1372 mm) above the car floor.

**3011.1.1 Sign tape.** The "CAUTION" sign tape shall be 3 inches (76 mm) in width with the words "CAUTION – DO NOT ENTER" repeated every 6 inches (152 mm). The lettering shall be black on yellow background. The letters shall be at least 2 inches (51 mm) high. Caution tape may be replaced with OSHA approved elevator barricades.

**3011.1.2 Elevator out of service.** When an elevator is out of service with the car door open at a landing prior to the elevator personnel arriving, Sections 3011.1 and 3011.1.1 shall apply.

### SECTION BC 3012 ACCIDENTS

**3012.1 Accidents.** The owner of any device regulated by this chapter shall promptly notify the commissioner of every accident involving injury to any person requiring the services of a physician or damage to property or to apparatus exceeding \$1,000 on, about, or in connection with such equipment, before commencing any repairs and shall afford the commissioner every facility for investigating such accident or damage. The commissioner shall make an investigation immediately thereafter, and shall prepare a full and complete report of such investigation. Such report shall give in detail all material facts and information available and the cause or causes as far as they can be determined. Such report shall be a public record. When an accident involves the failure or destruction of any part of the construction or operating mechanism of such equipment, no such equipment shall be used until it has been made safe, and re-inspected by the commissioner. The commissioner may order the discontinuance of such equipment until a new service equipment certificate has been issued by him or her for its use. No part shall be removed from the premises of the damaged construction or operating mechanism until permission to do so has been granted by the commissioner.

### SECTION BC 3013 EXISTING INSTALLATIONS

**3013.1 General.** Existing installations shall be modified in accordance with Appendix K, Chapter K3.

### SECTION BC 3014 INSPECTION AND TESTING

**3014.1 Elevators and conveying systems.** Inspection and testing of elevators and conveying systems shall be in accordance with Appendix K. Refer to Chapter 3 of Title 28 of the *Administrative Code* for additional requirements.

**3014.2 Amusement devices.** Inspection and testing of amusement devices shall comply with rules of the department. Refer to Chapter 3 of Title 28 of the *Administrative Code* for additional requirements.



## CHAPTER 31

# SPECIAL CONSTRUCTION

### SECTION BC 3101 GENERAL

**3101.1 Scope.** The provisions of this chapter shall govern special building construction including membrane structures, temporary structures, pedestrian walkways and tunnels, automatic vehicular gates, awnings, canopies, sun control devices, marquees, signs, telecommunications towers and antennas, swimming pools and enclosures, sidewalk cafés, and fences.

### SECTION BC 3102 MEMBRANE STRUCTURES

**3102.1 General.** The provisions of this section shall apply to air-supported structures, air-inflated structures, membrane-covered cable structures, membrane-covered frame structures and tents, collectively known as membrane structures.

**3102.1.1 Certificates of Occupancy.** The duration of Certificates of Occupancy for air-inflated structures, air-supported structures, and tents may be limited in accordance with the requirements of Chapter 1.

**3102.1.2 Temporary installations.** In addition to the requirements of Section 3102 of this code, temporary installations of air-supported structures, air-inflated structures, membrane-covered cable structures, membrane-covered frame structures and tents, collectively known as membrane structures shall comply with the requirements of Article 111 of Chapter 1 of Title 28 of the *Administrative Code*.

**3102.2 Definitions.** The following terms shall, for the purposes of this section and as used elsewhere in this code, have the meanings shown herein:

**AIR-INFLATED STRUCTURE.** A structure that uses air-pressurized membrane beams, arches or other elements to enclose space. Occupants of such a structure do not occupy the pressurized area used to support the structure.

**AIR-SUPPORTED STRUCTURE.** A building wherein the shape of the structure is attained and maintained by elevated air pressure and occupants of the structure are within the elevated pressure area. Air-supported structures are of two basic types:

**Double skin.** Similar to a single skin, but with an attached liner that is separated from the outer skin and provides an airspace which serves for insulation, acoustic, aesthetic or similar purposes.

**Single skin.** Where there is only the single outer skin and the air pressure is directly against that skin.

**CABLE-RESTRAINED, AIR-SUPPORTED STRUCTURE.** A structure in which the uplift is resisted by cables or webbings which are anchored to either foundations or

dead men. Reinforcing cable or webbing is attached by various methods to the membrane or is an integral part of the membrane. This is not a cable-supported structure.

**MEMBRANE-COVERED CABLE STRUCTURE.** A nonpressurized structure in which a mast and cable system provides support and tension to the membrane weather barrier and the membrane imparts stability to the structure.

**MEMBRANE-COVERED FRAME STRUCTURE.** A nonpressurized building wherein the structure is composed of a rigid framework to support a tensioned membrane which provides the weather barrier.

**NONCOMBUSTIBLE MEMBRANE STRUCTURE.** A membrane structure in which the membrane and all component parts of the structure are noncombustible.

**TENT.** A nonpressurized membrane structure of a fabric weather barrier supported by poles and guys, in which the fabric weather barrier does not impart stability to the structure. Tents need not be fully enclosed on the sides.

**3102.3 Type of construction.** Noncombustible membrane structures shall be classified as Type IIB construction. Noncombustible frame or cable-supported structures covered by an approved membrane in accordance with Section 3102.3.1 shall be classified as Type IIB construction. Heavy timber frame-supported structures covered by an approved membrane in accordance with Section 3102.3.1 shall be classified as Type IV construction. Other membrane structures shall be classified as Type V construction.

**3102.3.1 Membrane and interior liner material.** Membranes and interior liners shall be either noncombustible as set forth in Section 703.4, or meet the fire propagation performance criteria of NFPA 701 and the manufacturer's test protocol.

**3102.4 Allowable floor areas.** The area of a membrane structure shall not exceed the limitations set forth in Table 503, except as provided in Section 506.

**3102.5 Maximum height.** Membrane structures shall not exceed one story nor shall such structures exceed the height limitations in feet set forth in Table 503. Membrane structures may be erected above the roof of a building provided that such roof is of noncombustible construction required to have a fire-resistance rating.

**Exception:** Noncombustible membrane structures serving as roofs only.

**3102.6 Mixed construction.** Membrane structures shall be permitted to be utilized as specified in this section as a portion of buildings of other types of construction. Height and area limits shall be as specified for the type of construction and occupancy of the building.

**3102.6.1 Noncombustible membrane.** A noncombustible membrane shall be permitted for use as the roof or as a



skylight of any building or atrium of a building of any type of construction, provided it is at least 20 feet (6096 mm) above any floor, balcony or gallery, and meets the fire classification requirements of Section 1505 for roof assemblies.

**3102.6.1.1 Membrane.** A membrane meeting the fire propagation performance criteria of NFPA 701 shall be permitted to be used as the roof or as a skylight on buildings of Type IIB, III, IV and V construction, provided it is at least 20 feet (6096 mm) above any floor, balcony or gallery, and meets the fire classification requirements of Section 1505 for roof assemblies.

**3102.7 Engineering design.** Membrane structures shall be designed and constructed to sustain dead loads; loads due to tension or inflation; live loads including wind, snow or flood and seismic loads and in accordance with Chapter 16 and Appendix G.

**Exception:** Tents, air-inflated structures, and air-supported structures shall be designed by either an alternate engineering design approved by the commissioner or as follows:

1. Tents. Tents shall be guyed, supported, and braced to withstand a wind pressure of 10 psf (478.8 Pa) of projected area of the tent. The poles and their supporting guys, stays, stakes, fastenings, etc., shall be of sufficient strength and attached so as to resist wind pressure of 20 psf (957.6 Pa) of projected area of the tent.
2. Air-inflated structures and air-supported structures.
  - 2.1. Air-inflated structures and air-supported structures shall be anchored to the ground or supporting structure by either ballast or positive anchorage, sufficiently and evenly distributed, and adequate to resist the inflation lift load, the aerodynamic lift load, and the drag (shear) load due to wind impact. The latter factors shall be based on a fastest mile wind speed of 70 mph (112.65 km/hr), and an estimated stagnation of not less than 0.5 q for structures on grade whose height is equal to, or less than, the width of the structure. For greater heights, or for elevated structures, increased anchorage shall be provided, justified by analytical and/or experimental data subject to approval by the commissioner.
  - 2.2. The skin of the structure shall be of such strength, and the joints so constructed, as to provide a minimum dead load strip tensile strength at 70°F (21°C) of four times the 70 mph (121.65 km/hr) design load (inflation and aerodynamic loading). The joints shall provide a dead load strip tensile strength of 160°F (71°C) of twice the 70 mph (121.65 km/hr) design load (i.e., a factor of safety of 4 and 2, respectively). In addition, the material shall provide a trapezoidal tear strength of at least 15 percent of the maximum design tensile load. Material and joint strengths shall be so certified by the manufac-

turer, justified by analytical and/or experimental data.

**3102.8 Inflation systems.** Air-supported structures and air-inflated structures shall be provided with primary and auxiliary inflation systems to meet the minimum requirements of Sections 3102.8.1 through 3102.8.3.

**3102.8.1 Equipment requirements.** The primary inflation system shall consist of one or more blowers and shall include provisions for automatic control to maintain the required inflation pressures. Such system shall be so designed as to prevent over pressurization of the system.

**3102.8.1.1 Auxiliary inflation system.** In addition to the primary inflation system, in structures exceeding 1,500 square feet (140 m<sup>2</sup>) in area, an auxiliary inflation system shall be provided with sufficient capacity to maintain the inflation of the structure in case of primary system failure. The auxiliary inflation system shall operate automatically when there is a loss of internal pressure and when the primary blower system becomes inoperative.

**3102.8.1.2 Blower equipment.** Blower equipment shall meet all of the following requirements:

1. Blowers shall be powered by continuous-rated motors at the maximum power required for any flow condition as required by the structural design.
2. Blowers shall be provided with inlet screens, belt guards and other protective devices as required by the commissioner to provide protection from injury.
3. Blowers shall be housed within a weather-protecting structure.
4. Blowers shall be equipped with backdraft check dampers to minimize air loss when inoperative.
5. Blower inlets shall be located to provide protection from air contamination. The location of inlets shall be approved.

**3102.8.2 Standby power.** Wherever an auxiliary inflation system is required, an approved standby power-generating system shall be provided. However, notwithstanding Section 2702.1, the standby power-generating system shall be equipped with a suitable means for automatically starting the generator set upon failure of the normal electrical service and for automatic transfer and operation of all of the required electrical functions at full power within 60 seconds of such service failure. Standby power shall be capable of operating independently for a minimum of 4 hours.

**3102.8.3 Support provisions.** A system capable of supporting the membrane in the event of deflation shall be provided for in air-supported structures and air-inflated structures having an occupant load of 50 or more or where covering a swimming pool regardless of occupant load. Such support system shall be capable of maintaining the membranes at least 7 feet (2134 mm) above the floor, seating area or surface of the water. When air-supported

structures or air-inflated structures are used as a roof on Type I or II construction buildings, such support system shall be capable of maintaining the membranes not less than 20 feet (6096 mm) above the floor or seating area.

**3102.9 Separation.** No air-inflated structure, air-supported structure, or tent shall be erected closer than 20 feet (6096 mm) to any interior lot line nor closer than 30 feet (9144 mm) in any direction to an unprotected opening, required exterior stairway or corridor, or required exit door, on the same level or above the level of such structure. Such structure may abut another building on the same tax lot if the following conditions exist:

1. No unprotected openings or exits are located above or within 30 feet (9144 mm) of such structure.
2. No doors serving as a required exit are located between such structure and the abutted building.
3. The exterior wall of the abutted building meets the requirements of Section 705 for fire walls.

**3102.10 Exits.** In addition to the requirements of Chapter 10, travel distance to an exit from any point within a tent, air-supported structure, or air-inflated structure shall not exceed 75 feet (22 860 mm).

**3102.10.1 Exit openings from tents.** Exit openings from tents shall remain open unless covered by a flame-resistant curtain of a contrasting color to the tent. Such curtain shall be supported at least 80 inches (2032 mm) above the floor level at the exit and, when open, no part of the curtain shall obstruct the exit.

**3102.10.2 Exit openings from air-supported structures and air-inflated structures.** Exit doors in air-supported structures and air-inflated structures shall close automatically against normal operational pressures. Opening force at the edge of such doors shall not exceed 15 pounds (6.80 kg), with the structure at operational pressure. Exit doors shall be located in frames constructed such that they will remain operative and support the weight of the pressurized membrane structure in a state of total collapse.

## SECTION BC 3103 TEMPORARY STRUCTURES

**3103.1 General.** The provisions of this section shall apply to temporary tents, grandstands, platforms, reviewing stands, outdoor bandstands, stages and similar miscellaneous structures erected for a period of 90 days or less. Such structures may be constructed of wood whether located inside or outside of the fire districts.

**3103.1.1 Permit required.** Temporary structures shall not be erected, operated or maintained for any purpose without obtaining a permit from the department in accordance with Section 28.111.1.1 of the *Administrative Code*.

**Exception:** No permit shall be required for:

1. The erection and use of temporary tents of less than 400 gross square feet (37 m<sup>2</sup>) for not more than 30 days.

2. The erection and use of temporary platforms, reviewing stands, outdoor bandstands, and similar miscellaneous structures that cover an area less than 120 square feet (11.16 m<sup>2</sup>), including connecting areas or spaces with a common means of egress or entrance, for not more than 30 days.

**3103.2 Construction documents.** A permit application and construction documents shall be submitted for each installation of a temporary structure. The construction documents shall include a site plan indicating the location of the temporary structure and information delineating the means of egress and the occupant load.

**3103.3 Location.** Temporary structures shall be located in accordance with the requirements of Table 602 based on the fire-resistance rating of the exterior walls for the proposed type of construction.

**3103.4 Means of egress.** Temporary structures shall conform to the means of egress requirements of Chapter 10 and shall have a maximum exit access travel distance of 100 feet (30 480 mm).

## SECTION BC 3104 PEDESTRIAN WALKWAYS AND TUNNELS

**3104.1 General.** This section shall apply to connections between buildings such as pedestrian walkways or tunnels, located at, above or below grade level, that are used as a means of travel by persons. The pedestrian walkway shall not contribute to the building area or the number of stories or height of connected buildings.

**3104.2 Separate structures.** Connected buildings shall be considered to be separate structures.

### Exceptions:

1. Buildings on the same tax lot in accordance with Section 503.1.2.
2. For purposes of calculating the number of Type B units required by Chapter 11, structurally connected buildings and buildings with multiple wings shall be considered one structure.

**3104.3 Construction.** The pedestrian walkway shall be of a Construction Type that is at least equal to the higher type of the two buildings connected.

**Exception:** Exterior pedestrian walkways serving as a required exit shall be constructed of noncombustible materials.

**3104.4 Contents.** Only materials approved by the department shall be located in the pedestrian walkway. Decorations may be permitted in accordance with the *New York City Fire Code*.

**3104.5 Fire barriers between pedestrian walkways and buildings.** Walkways shall be separated from the interior of the building by not less than 2-hour fire barriers constructed in accordance with Section 707 or horizontal assemblies constructed in accordance with Section 712, or both. This protection shall extend vertically from a point 10 feet (3048 mm) above the walkway roof surface or the connected building

roof line, whichever is lower, down to a point 10 feet (3048 mm) below the walkway and horizontally 10 feet (3048 mm) from each side of the pedestrian walkway. Openings within the 10-foot (3048 mm) horizontal extension of the protected walls beyond the walkway shall be equipped with devices providing a  $\frac{3}{4}$ -hour fire protection rating in accordance with Section 715.

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**Exception:** On pedestrian walkways (i) having a maximum height above grade of three stories or 40 feet (12 192 mm), whichever is less; or (ii) where protected by sprinklers, five stories or 55 feet (16 764 mm), whichever is less, the walls separating the pedestrian walkway from a connected building and the openings within the 10 foot (3048 mm) horizontal extension of the protected walls beyond the walkway are not required to have a fire barrier by this section where any of the following conditions exist:

1. The distance between the connected buildings is more than 10 feet (3048 mm). ‡The pedestrian walkway and connected buildings, except for open parking garages, are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. The wall is capable of resisting the passage of smoke or is constructed of a tempered, wired or laminated glass wall and doors subject to the following:
  - 1.1. The wall or glass separating the interior of the building from the pedestrian walkway shall be protected by an automatic sprinkler system in accordance with Section 903.3.1.1 and the sprinkler system shall completely wet the entire surface of interior sides of the wall or glass when actuated.
  - 1.2. The glass shall be in a gasketed frame and installed in such a manner that the framing system will deflect without breaking (loading) the glass before the sprinkler operates; and‡
  - 1.3. Obstructions shall not be installed between the sprinkler heads and the wall or glass.
2. The distance between the connected buildings is more than 10 feet (3048 mm), and both sidewalls of the pedestrian walkway are at least 50 percent open with the open area uniformly distributed to prevent the accumulation of smoke and toxic gases.
3. Buildings are on the same tax lot, in accordance with Section 503.1.3.
4. Where exterior walls of connected buildings are required by Section 705‡ to have a fire-resistance rating greater than 2 hours, the walkway shall be equipped throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1.
5. The pedestrian walkway does not serve as a required exit.

**3104.6 Public way.** Pedestrian walkways over a public way shall also comply with Chapter 32.



**3104.7 Width.** The unobstructed width of pedestrian walkways shall not be less than 36 inches (914 mm). The total width shall not exceed 30 feet (9144 mm).

**3104.8 Egress.** Access shall be provided at all times to a pedestrian walkway that serves as a required exit. Doors satisfying the requirements of Chapter 10 shall enclose each end of such pedestrian walkway. The width of such pedestrian walkway shall be at least equal to the width of the doors opening onto such pedestrian walkway, but in no case less than 44 inches (1118 mm). The floor level at doors shall be the same as that of the connected building.

**Exception:** The floor level at doors of open pedestrian walkways shall be at least 7½ inches (191 mm) below the level of the door. Where the requirements of Chapter 11 are applicable, the differences in levels shall be accommodated by means of ramps in compliance with the provisions of Chapter 11.

**3104.9 Exit access travel.** The length of exit access travel shall not exceed 200 feet (60 960 mm).

### Exceptions:

1. Exit access travel distance on a pedestrian walkway equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 shall not exceed 250 feet (76 200 mm).
2. Exit access travel distance on a pedestrian walkway constructed with both sides at least 50 percent open shall not exceed 300 feet (91 440 mm).
3. Exit access travel distance on a pedestrian walkway constructed with both sides at least 50 percent open, and equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, shall not exceed 400 feet (122 m).

**3104.10 Tunneled walkway.** Separation between the tunneled walkway and the building to which it is connected shall not be less than 2-hour fire-resistant construction and openings therein shall be protected in accordance with Table 715.4.

## SECTION BC 3105 AWNINGS, CANOPIES AND SUN CONTROL DEVICES

**3105.1 General.** Awnings, canopies, and sun control devices shall comply with the requirements of this section, the requirements of Chapter 32 for projections over public ways, and other applicable sections of this code.

**Exception:** Canopies projecting over public rights-of-way governed by Title 19 of the *Administrative Code* and rules of the New York City Department of Transportation.

**3105.2 Definition.** The following term shall, for the purposes of this section and as used elsewhere in this code, have the meaning shown herein.

**RETRACTABLE AWNING.** A retractable awning is a cover with a frame that retracts against a building or other structure to which it is entirely supported.



**NYC 3105.3 Design and construction.** Awnings, canopies, and sun control devices shall be designed and constructed to withstand wind or other lateral loads and live loads as required by Chapter 16 with due allowance for shape, open construction and similar features that relieve the pressures or loads. Structural members shall be protected to prevent deterioration. Awnings shall have frames of noncombustible material, covered with fabric that meets the fire propagation performance criteria of NFPA 701, plastic in accordance with Section 2605, sheet metal, or other equivalent material, and shall be either fixed, retractable, folding or collapsible. Sun control devices shall be constructed of noncombustible materials.

**NYC 3105.4 Reserved.**

## SECTION BC 3106 MARQUEES

**NYC 3106.1 General.** Marquees shall comply with this section and other applicable sections of this code. Marquees projecting beyond the street line shall also comply with the requirements of Chapter 32. Signs placed on marquees shall also comply with Section 3107.

**NYC 3106.2 Thickness.** The maximum height or thickness of a marquee measured vertically from its lowest to its highest point shall not be limited.

**NYC Exception:** Marquees projecting beyond the street line shall meet the height and thickness requirements of Chapter 32.

**NYC 3106.3 Roof construction.** Where the roof or any part thereof is a skylight, the skylight shall comply with the requirements of Chapter 24. Every roof and skylight of a marquee shall be drained in accordance with the provisions of the *New York City Plumbing Code*.

**NYC 3106.4 Location prohibited.** Every marquee shall be so located as not to interfere with the operation of any exterior standpipe, and such that the marquee does not obstruct the clear passage of stairways or exit discharge from the building or the installation or maintenance of street lighting.

**NYC 3106.5 Construction.** A marquee shall be supported entirely from the building and constructed of noncombustible materials. Marquees shall be designed as required in Chapter 16. Structural members shall be protected to prevent deterioration.

## SECTION BC 3107 SIGNS

**NYC 3107.1 General.** Signs shall be designed, constructed and maintained in accordance with Appendix H.

## SECTION BC 3108 RADIO, TELEVISION, AND TELECOMMUNICATIONS TOWERS AND ANTENNAS

**NYC 3108.1 General.** Subject to the provisions of Chapter 16 and the requirements of Chapter 15 governing the fire-resistance ratings of buildings for the support of roof structures, radio,

television, and telecommunications towers and antennas shall be designed and constructed as herein provided. All such towers and antennas shall be collectively referred to as "towers" for the purposes of this section. Towers shall be designed and constructed in accordance with the provisions of TIA-222.

**3108.2 Location and access.** Towers shall be located and equipped with step bolts and ladders so as to provide ready access for inspection purposes. Guy wires or other accessories shall not cross or encroach upon any street or other public space, or over above-ground electric utility lines, or encroach upon any privately owned property without written consent of the owner of the encroached-upon property, space or above-ground electric utility lines. Towers shall be equipped with climbing and working facilities in compliance with TIA-222. See applicable OSHA, FCC and EPA regulations relating to limitations on access to tower sites.

**3108.3 Construction.** Towers shall be constructed of approved corrosion-resistant noncombustible material. The minimum type of construction of isolated radio towers not more than 100 feet (30 480 mm) in height shall be Type IIB.

**3108.4 Loads.** Towers shall be designed to resist wind loads in accordance with TIA/EIA-222. Consideration shall be given to conditions involving wind load on ice-covered sections.

**3108.4.1 Dead load.** Towers shall be designed for the dead load plus ice load.

**3108.4.2 Wind load.** Towers shall be provided with adequate foundations and anchorage designed to resist two times the calculated wind load.

**3108.5 Grounding.** Towers shall be permanently and effectively grounded in accordance with the *New York City Electrical Code*.

## SECTION BC 3109 SWIMMING POOLS, SWIMMING POOL ENCLOSURES, AND SAFETY DEVICES

**3109.1 General.** Swimming pools, swimming pool enclosures, and swimming pool safety devices shall comply with the requirements of this section and other applicable sections of this code.

**3109.2 Definitions.** The following terms shall, for the purposes of this section and as used elsewhere in this code, have the meaning shown herein.

**BARRIER, TEMPORARY.** An approved temporary fence, permanent fence, the wall of a permanent structure, any other structure, or any combination thereof that prevents access to the swimming pool by any person not engaged in the installation or construction of the swimming pool during its installation or construction.

**SWIMMING POOL.** Any indoor or outdoor swimming, wading, spa, or special-purpose pool.

### Exceptions:

1. Portable, freestanding wading pools containing water less than 24 inches (610 mm) in depth.



2. Float tanks or relaxation tanks sized for use by one person at a time.
3. Pools used for religious purposes.
4. Spa pools used for prescribed medical therapy or rehabilitation and under medical supervision.

**SWIMMING POOL, PRIVATE.** A swimming pool that is accessory to a one- or two-family dwelling, or to a single-dwelling unit of a multiple dwelling, and that is solely for the use of the occupants for noncommercial purposes.

**SWIMMING POOL, PUBLIC.** A swimming pool that is not a private swimming pool. Public swimming pools include swimming pools that are accessory to bathing establishments as such term is defined in the *New York City Health Code*, whether owned or operated by city agencies, or commercial interests or private entities, including, but not limited to, public or private schools, corporations, hotels, motels, camps, apartment houses, condominiums, country clubs, gymnasias and health establishments.

**3109.3 Pool safety and accessibility.** Public and private swimming pools shall comply with the requirements for safety and accessibility as provided in this section.

**3109.3.1 Entrapment protection.** Entrapment protection shall be provided in compliance with this section.

**3109.3.1.1 Suction entrapment avoidance.** Suction outlets shall be designed and installed in accordance with ANSI/APSP-7.

**3109.3.2 Swimming pool and spa alarms.** Swimming pool and spa alarms shall comply with Sections 3109.3.2.1 through 3109.3.2.4.

**3109.3.2.1 Applicability.** All swimming pools and spas shall be equipped with an approved pool alarm. Pool alarms shall comply with ASTM F 2208 and shall be installed, used and maintained in accordance with the manufacturer's instructions and this section.

**Exceptions:**

1. A hot tub or spa equipped with a safety cover that complies with ASTM F 1346.
2. A swimming pool (other than a hot tub or spa) equipped with an automatic power safety cover that complies with ASTM F 1346.

**3109.3.2.2 Multiple alarms.** A pool alarm must be capable of detecting entry into the water at any point on the surface of the swimming pool. If necessary to provide detection capability at every point on the surface of the swimming pool, more than one pool alarm shall be provided.

**3109.3.2.3 Alarm activation.** Pool alarms shall activate upon detecting entry into the water and shall sound poolside and inside the building.

**3109.3.2.4 Prohibited alarms.** The use of personal immersion alarms shall not be construed as compliance with this section.

**3109.3.3 Water circulation, water treatment and drainage.** The supply, circulation, treatment, and drainage of

water for swimming pools shall meet the requirements of the *New York City Plumbing Code*.

**3109.3.4 Electrical precautions.** No overhead electrical conductors shall be installed within 15 feet (4572 mm) of any swimming pool. All metal fences, enclosures, or railings that might become electrically charged as a result of contact with broken overhead conductors or from any other cause near, or adjacent to, a swimming pool shall be grounded in accordance with the provisions of lightning protection in the *New York City Electrical Code*.

**3109.3.5 Facilities for people with disabilities.** Facilities for people with physical disabilities shall be provided where required by Chapter 11 of this code.

**3109.4 Public swimming pools.** Public swimming pools shall comply with the requirements for safety and accessibility as provided in Sections 3109.3 and 3109.4.

**Exceptions:** A swimming pool with a power safety cover or a spa with a safety cover complying with ASTM F 1346.

**3109.4.1 Barrier height and clearances.** Public swimming pools shall be completely enclosed by a fence, wall, building, or other solid barrier, or any combination thereof, at least 6 feet (1829 mm) in height. Openings in the enclosure and pedestrian access gates shall not permit the passage of a 4-inch-diameter (102 mm) sphere. The enclosure shall be equipped with self-closing and self-latching gates.

**Exception:** Enclosures shall be at least 4 feet (1219 mm) in height when surrounding wading pools with water less than 24 inches (610 mm) in depth.

**3109.4.2 Gates.** Gates shall comply with Sections 3109.4.2.1 through 3109.4.2.3.

**3109.4.2.1 Self-closing; opening configuration.** All gates shall be self-closing. In addition, if the gate is a pedestrian access gate, the gate shall open outward, away from the pool.

**3109.4.2.2 Self-latching; location of latch handle.** All gates shall be self-latching, with the latch handle located within the enclosure (i.e., on the pool side of the enclosure) and at least 40 inches (1016 mm) above grade. If the latch handle is located less than 54 inches (1372 mm) from the bottom of the gate, the latch handle shall be located at least 3 inches (76 mm) below the top of the gate, and neither the gate nor barrier shall have any opening greater than 0.5 inch (12.7 mm) within 18 inches (457 mm) of the latch handle.

**3109.4.2.3 Locking.** All gates shall be securely locked with a key, combination or other child proof lock sufficient to prevent access to the swimming pool through such gate when the swimming pool is not in use or supervised.

**3109.4.3 Other laws.** In addition to the requirements of this section, any other, more stringent requirements for the construction and design of swimming pool and barriers that may be provided for in Article 165 of the *New York City Health Code*, as administered by the New York

NYC City Department of Health and Mental Hygiene, shall also be applicable.

NYC **3109.5 Private swimming pools.** Private swimming pools shall comply with the requirements for safety and accessibility as provided in Section 3109.3 and this section.

NYC **Exception:** An above-ground private swimming pool which has a maximum water depth of 4 feet (1219 mm) and an area not exceeding 500 square feet (46.45 m<sup>2</sup>) that is accessory to an R-3 occupancy and is privately used for noncommercial purposes shall not be required to comply with Sections 3109.3.1, 3109.3.2, 3109.5.2, 3109.5.3 and 3109.5.4.

NYC **3109.5.1 Barrier height and clearances.** The top of the barrier enclosing a private swimming pool shall be at least 48 inches (1219 mm) above grade measured on the side of the barrier that faces away from the swimming pool. The maximum vertical clearance between grade and the bottom of the barrier shall be 2 inches (51 mm) measured on the side of the barrier that faces away from the swimming pool. Where the top of the pool structure is above grade, the barrier is authorized to be erected at grade level or mounted on top of the pool structure. The maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches (102 mm).

**3109.5.1.1 Openings.** Openings in the barrier shall not allow passage of a 4-inch-diameter (102 mm) sphere.

**3109.5.1.2 Solid barrier surfaces.** Solid barriers which do not have openings shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints.

**3109.5.1.3 Closely spaced horizontal members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches (1143 mm), the horizontal members shall be located on the swimming pool side of the fence. Spacing between vertical members shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width.

**3109.5.1.4 Widely spaced horizontal members.** Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, spacing between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width.

**3109.5.1.5 Chain link dimensions.** Maximum mesh size for chain link fences shall be a 2<sup>1</sup>/<sub>4</sub> inch square (57 mm square) unless the fence is provided with slats fastened at the top or the bottom which reduce the openings to no more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm).

NYC **3109.5.1.6 Diagonal members.** Where the barrier is composed of diagonal members, the spacing between

parallel diagonal members shall be no more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm).

**3109.5.1.7 Gates.** Gates shall comply with Sections 3109.5.1.1 through 3109.5.1.6 and Sections 3109.5.1.7.1 through 3109.5.1.7.3.

**3109.5.1.7.1 Self-closing; opening configuration.**

All gates shall be self-closing. In addition, if the gate is a pedestrian access gate, the gate shall open outward, away from the pool.

**3109.5.1.7.2 Self-latching; location of latch handle.**

All gates shall be self-latching, with the latch handle located within the enclosure (i.e., on the pool side of the enclosure) and at least 40 inches (1016 mm) above grade. In addition, if the latch handle is located less than 54 inches (1372 mm) from the bottom of the gate, the latch handle shall be located at least 3 inches (76 mm) below the top of the gate, and neither the gate nor barrier shall have any opening greater than 0.5 inch (12.7 mm) within 18 inches (457 mm) of the latch handle.

**3109.5.1.7.3 Locking.** All gates shall be securely locked with a key, combination or other child proof lock sufficient to prevent access to the swimming pool through such gate when the swimming pool is not in use or supervised.

**3109.5.1.8 Dwelling wall as a barrier.** Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:

1. Doors with direct access to the pool through that wall shall be equipped with an alarm that produces an audible warning when the door and/or its screen, if present are opened. The alarm shall be listed in accordance with UL 2017. The audible alarm shall activate within 7 seconds and sound continuously for a minimum of 30 seconds immediately after the door and/or its screen, if present, are opened and be capable of being heard throughout the house during normal household activities. The alarm shall automatically reset under all conditions. The alarm shall be equipped with a manual means, such as touchpad or switch, to temporarily deactivate the alarm for a single opening. Such deactivation shall last no more than 15 seconds. In dwellings not required to be accessible Type B units, the deactivation switch shall be located 54 inches (1372 mm) or more above the threshold of the door. In dwellings required to be accessible Type B units, the deactivation switch(es) shall be located at 54 inches (1372 mm) maximum and 48 inches (1219 mm) minimum above the threshold of the door.

2. The swimming pool shall be equipped with a power safety cover which complies with ASTM F 1346.

3. The door providing access to the swimming pool from the dwelling shall open inward, away from the swimming pool, and shall be self-closing and

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have a self-latching device. The release mechanism of the self-latching device shall be located no less than 54 inches (1372 mm) from the bottom of the door.

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**3109.5.1.9 Pool structure as barrier.** Where an aboveground private swimming pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps, then the ladder or steps either shall be capable of being secured, locked or removed to prevent access, or the ladder or steps shall be surrounded by a barrier which meets the requirements of Sections 3109.5.1.1 through 3109.5.1.8. When the ladder or steps are secured, locked or removed, any opening created shall not allow the passage of a 4-inch-diameter (102 mm) sphere.

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**3109.5.2 Indoor swimming pools.** Walls surrounding indoor private swimming pools shall not be required to comply with Section 3109.5.1.8.

**3109.5.3 Prohibited locations.** Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers.

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**3109.5.4 Construction requirements.** Private swimming pools shall be constructed so as to be water tight and easily cleaned. They shall be built of nonabsorbent materials with smooth surfaces and shall be free of open cracks and open joints.

**3109.5.4.1 Walls.** The walls of swimming pools shall be vertical for at least the top 30 inches (762 mm) below the normal water level. The junctions between the side walls and the bottom shall be coved. A swimming pool overflow shall be provided meeting the requirements of the *New York City Plumbing Code*.

**3109.5.4.2 Bottom slopes.** The bottom of the swimming pool shall slope downward toward the main drains. The slope in shallow areas with depths less than 5 feet (1524 mm) shall not exceed 1 unit vertical in 12 units horizontal (8-percent slope). In portions of the swimming pool with depth greater than 5 feet (1524 mm), the slope shall not be steeper than 1 unit vertical in 3 units horizontal (33-percent slope).

**3109.5.4.3 Ladders.** There shall be a ladder or steps with handrails at the deep end and at the shallow end of every swimming pool. Ladders and steps shall have no-slip treads. All ladders shall be rigidly installed and shall be constructed of corrosion-resistant materials.

**3109.5.4.4 Walkways.** Every swimming pool shall have a walkway at least 5 feet (1524 mm) wide around its entire perimeter. The walkway shall have a nonslip surface and shall be constructed to drain away from the swimming pool.

**3109.5.4.5 Handholds.** Every swimming pool shall be constructed so that either the overflow gutter, if provided, or the tops of the side walls afford a continuous handhold for bathers.

**3109.5.4.6 Markings.** Permanent markings showing the depth of the shallow end, break points, diving depth and deep end shall be provided so as to be visible from both inside and outside the swimming pool.

**3109.5.4.7 Diving boards and towers.** Diving towers shall be rigidly constructed and permanently anchored. The depth of the water below a diving board shall be at least 102 inches (2591 mm) for a board 39 inches (991 mm) or less above the water. For a diving board more than 39 inches (991 mm) and not more than 118 inches (2997 mm) above the water, the depth of the water below the board shall be at least 144 inches (3658 mm). For a diving board or platform more than 118 inches (2997 mm) above the water, the depth of the water below the board shall be at least 192 inches (4877 mm). Indoor swimming pools shall provide at least 144 inches (3658 mm) overhead clearance above all diving boards.

**3109.6 Temporary barriers.** An outdoor swimming pool, including an in-ground, above-ground or on-ground pool, hot tub or spa shall be surrounded by a temporary barrier during installation or construction. Such barrier shall remain in place until a permanent fence in compliance with Section 3109.4 is provided for public swimming pools, or a barrier in compliance with Section 3109.5 is provided for residential private pools.

#### Exceptions:

1. Above-ground or on-ground residential swimming pools where the pool structure is the barrier in compliance with Section 3109.
2. Spas or hot tubs with a safety cover which complies with ASTM F 1346, provided that such safety cover is in place during the period of installation or construction of such hot tub or spa. The temporary removal of a safety cover as required to facilitate the installation or construction of a hot tub or spa during periods when at least one person engaged in the installation or construction is present is permitted.

**3109.6.1 Height.** The top of the temporary barrier shall be at least 48 inches (1219 mm) above grade measured on the side of the barrier which faces away from the swimming pool.

**3109.6.2 Replacement by a permanent barrier.** A temporary barrier shall be replaced by a complying permanent barrier within either of the following periods:

1. 90 days of the date of issuance of the building permit for the installation or construction of the swimming pool; or
2. 90 days of the date of commencement of the installation or construction of the swimming pool.

**3109.6.2.1 Replacement extension.** Subject to the approval of the code enforcement official, the time period for completion of the permanent barrier may be extended for good cause, including, but not limited to, adverse weather conditions delaying construction.



## SECTION BC<sup>†</sup> 3110 AUTOMATIC VEHICULAR GATES

**3110.1 General.** Automatic vehicular gates shall comply with the requirements of this section and other applicable sections of this code.

**3110.2 Definitions.** The following term shall, for the purposes of this section and as used elsewhere in this code, have the meaning shown herein.

**VEHICULAR GATE.** A gate that is intended for use at a vehicular entrance or exit and that is not intended for use by pedestrian traffic.

**3110.3 Vehicular gates intended for automation.** Vehicular gates intended for automation shall be designed, constructed and installed to comply with the class of gate in accordance with the requirements of ASTM F 2200.

**3110.3.1 Entrapment protection.** Defined classes of gates shall be subject to the entrapment protection provisions per UL 325.

**3110.4 Vehicular gate operators.** Vehicular gate operators, when provided, shall be listed in accordance with UL 325.

## SECTION BC 3111 SIDEWALK CAFÉS

**3111.1 General.** Sidewalk cafés provided beyond the building line shall comply with the requirements of this section, the *New York City Zoning Resolution*, the Commissioners of the Department of Consumer Affairs and Department of Transportation, and with the projection limitations of Chapter 32 of this code.

**3111.2 Enclosures.** Enclosed sidewalk cafés shall be constructed of noncombustible material. The walls of such enclosures shall not extend more than 8 feet (2438 mm) above the sidewalk. Light-transmitting plastic glazing complying with Section 2606 shall be permitted as glazing within such walls. Light-transmitting plastic skylight glazing complying with Section 2610 may be installed in the roofs of such enclosures.

**3111.3 Awnings.** Awnings supported entirely from the building may be placed over unenclosed sidewalk cafés provided they are at least 8 feet (2438 mm) clear above the sidewalk and within the limits specified by the Commissioner of the Department of Consumer Affairs. Such awnings shall be in compliance with Section 3105 of this code.

**3111.4 Obstructions prohibited.** No part of any awning, enclosure, fixture, equipment or removable platform of a sidewalk café shall be located:

1. Beneath a fire escape so as to obstruct operation of fire escape drop ladders or counter-balanced stairs;
2. So as to obstruct any exit from a building;
3. So as to obstruct any cellar access hatch or areaway;
4. So as to interfere with any vent or other mechanical ventilation outlet or inlet;

5. So as to interfere with or obscure any standpipe connections, hydrant or associated signage in any way that would hinder its use by the Fire Department.

**Exception:** Upon special application, the commissioner may permit an easily removable, prominently designated platform, designed in accordance with Section 3111.5, to cover a cellar entrance or areaway that is not used as a required means of egress.

**3111.5 Removable platforms.** Removable platforms of sidewalk cafés shall be constructed in accordance with the requirements of this section.

**3111.5.1 Continuity.** Removable platforms shall be constructed to provide for a continuous unbroken and level floor without openings or cracks so as to prevent any material or liquid from falling through to the area beneath.

**3111.5.2 Maintenance.** No papers, trash or other materials may be permitted to accumulate in the area beneath the floor of any removable platform.

**3111.6 Accessibility.** Sidewalk cafés and access thereto shall comply with Chapter 11.

**3111.7 Assembly seating.** Unless separated from seating inside the building by fire partitions complying with Section 708, the seating for enclosed sidewalk cafés shall be added to that inside the building in order to determine whether a place of assembly certificate of operation is required.

**3111.8 Rules.** In addition to the requirements specified herein, the commissioner may promulgate such additional rules necessary to secure safety.

## SECTION BC 3112 FENCES

**3112.1 Permitted heights.** Fences are permitted to be erected to a maximum height of 10 feet (3048 mm) above the ground.

### Exceptions:

1. In residence districts, as established by the *New York City Zoning Resolution*, fences are permitted to be erected to a maximum height of 6 feet (1829 mm) above the ground.
2. Fences in residence districts used in conjunction with nonresidence buildings and public playgrounds, excluding buildings accessory to dwellings, are permitted to be erected to a maximum height of 15 feet (4572 mm) above the ground.
3. Higher fences may be permitted by the commissioner where required for the enclosure of public playgrounds, school yards, parks, and similar public facilities.





## CHAPTER 32

# ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY

### SECTION BC 3201 GENERAL

**3201.1 Scope.** The provisions of this chapter shall govern the encroachment of structures into the public right-of-way.

**3201.1.1 Encroachments removable.** All encroachments permitted beyond the street line by the provisions of this chapter shall be constructed so that they may be removed at any time without endangering the structural safety or fire safety of the building except that footings as permitted under Section 3202.1.1 of this code need not be removable.

**3201.2 Measurement.** The projection of any structure or portion thereof shall be the distance measured horizontally from the lot line to the outermost point of the projection.

**3201.3 Other laws.** The provisions of this chapter shall not be construed to permit the violation of other laws regulating the use and occupancy of public property.

**3201.3.1 Restrictions on construction and projections on certain streets, parkways, boardwalks and beaches.** Notwithstanding the provisions of this chapter, it shall be unlawful to build, erect, or make areaways, steps or other encroachments or projections prohibited by Sections 19-131, 19-132, 19-135, 18-109, 18-112 and 18-113 of the *Administrative Code*.

**3201.4 Drainage.** Drainage water collected from a roof, awning, canopy or marquee, other than canvas and flexible material, and condensate from mechanical equipment shall not flow over a public walking surface.

**3201.5 Permission revocable.** Any permission, expressed or implied, permitting the construction of encroachments within the area of the street under the provisions of this chapter shall be revocable, except footings as permitted under Section 3202.1.1.

**3201.6 Existing projections.** Any part of a building that projects beyond a street line on January 1, 1938, may be maintained as constructed until its removal is directed in accordance with applicable law.

**3201.7 Alteration of existing encroachments.** Alterations to existing encroachments beyond the street line may be permitted in whole or in part, provided that such alterations conform with the requirements of this chapter.

**3201.8 Definitions.** As used in this chapter, the following terms shall have the following meanings:

**AREAWAY.** A space below grade adjacent to a building open to the outer air and enclosed by walls.

**CURB LINE.** The line coincident with the face of the street curb adjacent to the roadway.

**FOOTING.** A foundation element consisting of an enlargement of a foundation pier or foundation wall, wherein the soil materials along the side of and underlying the element

may be visually inspected prior to and during its construction.

**PROJECTING SIGN.** A sign other than a wall sign, which projects from and is supported by a wall of a building or structure.

**SIGN.** Any letter, figure, character, mark, plane, point, marquee sign, design, poster, pictorial, picture, stroke, stripe, line, trademark, reading matter or illuminated service, which shall be constructed, placed, attached, painted, erected, fastened or manufactured in any manner whatsoever, so that the same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine or merchandise, whatsoever, which is displayed in any manner outdoors. Every sign shall be classified and conform to the requirements of that classification as set forth in this chapter.

**STREET.** A thoroughfare, including sidewalks and roadways, dedicated or devoted to public use by legal mapping or other lawful means, or a public way.

**STREET LINE.** A lot line separating a street from other land.

**VAULT.** Any space below the surface of a street, that is covered over, except those openings that are used exclusively as places for descending, by means of steps, to the cellar or basement of any building.

**3201.9 Department of Transportation approval.** Any encroachment into the public right-of-way that exceeds the limitation provided for in this chapter shall require the approval of the Department of Transportation.

### SECTION BC 3202 ENCROACHMENTS

**3202.1 Encroachments below grade.** Encroachments below grade shall comply with Sections 3202.1.1 through 3202.1.4.

**3202.1.1 Footings.** Exterior wall and column footings may be constructed to project beyond the street line not more than 12 inches (305 mm), provided that the top of the footing is not less than 8 feet (2438 mm) below the ground or sidewalk level. Foundation walls required to support permitted projections may be constructed to project not more than the permitted projection beyond the street line.

**3202.1.1.1 Footings for temporary barriers or shields in areas of special flood hazard or shaded X-Zones.** In areas of special flood hazard or shaded X-Zones, continuous footings for the support and attachment of temporary, removable dry floodproofing barriers or shields may be constructed to project beyond the street line not more than 12 inches (305 mm) both at grade and below grade.

**3202.1.2 Vaults.** Vaults may be permitted in accordance with the New York City Charter and Chapter 19 of the *Administrative Code*. Such vaults shall comply with the provisions of this code and other applicable laws and rules.

**3202.1.3 Areaways.** Areaways shall be protected by grates, guards or other approved means, subject to approval by the Commissioner of the Department of Transportation.

**3202.1.4 Tunnels between buildings.** Tunnels connecting buildings and projecting beyond street lines may be constructed subject to the approval of the Commissioner of the Department of Transportation. Such tunnels shall comply with the provisions of this code and other applicable laws and regulations.

**3202.1.5 Sidewalk supports.** Exterior foundation walls are permitted to be constructed with a ledge that projects beyond the street line not more than 4 inches (102 mm) to support sidewalk construction, provided that:

1. the top of the ledge is not more than 8 inches (203 mm) below the ground or sidewalk level; and
2. bottom of the ledge is not more than 24 inches (610 mm) below the ground or sidewalk level.

**3202.2 Encroachments above grade.** Encroachments into the public right-of-way above grade shall be prohibited except as provided for in Sections 3202.2.1 through 3202.2.3.

**3202.2.1 Encroachments subject to the area limitations.** Encroachments that are subject to area limitations are those elements listed in Sections 3202.2.1.1 through 3202.2.1.9, generally of an architectural character, that form an integral part of the building facade. The aggregate area of all such elements constructed to extend beyond the street line shall not exceed 10 square feet (0.93 m<sup>2</sup>) within any 10 feet (3048 mm) by 10 feet (3048 mm) square area of wall, except that a veneer may be applied to the entire facade of a building erected before December 6, 1968, if such veneer does not project more than 4 inches (102 mm) beyond the street line. The area of any such projection shall be measured at that vertical plane, parallel to the wall, in which the area of the projection is greatest. This plane of measurement may be at the street line, the line of maximum projection or any point in between. For the purpose of measuring the projected area of a balcony, air spaces of less than 6 inches (152 mm) between closely spaced railing or guards elements shall contribute to the area of the projection.

**Exception:** The aggregate area of all elements subject to area limitations that includes a balcony or associated railings and brackets shall not exceed 24 square feet (2.2 m<sup>2</sup>) in any 240 square foot (22.3 m<sup>2</sup>) area on a given story.

**3202.2.1.1 Entrance details.** Entrance details, including steps and doors when fully open, may be constructed to project beyond the street line not more than 18 inches (457 mm). Entrance steps that project beyond the street line shall be guarded at each end by

railings at least 3 feet (914 mm) high or by other members of the entrance detail providing equivalent protection.

**3202.2.1.2 Architectural details.** Details such as cornices, eaves, bases, sills, headers, band course, opening frames, rustications, applied ornament or sculpture, grilles, windows when fully open, air conditioning units, and other similar elements may be constructed:

1. To project not more than 4 inches (102 mm) beyond the street line when less than 10 feet (3048 mm) above the ground or sidewalk level.
2. To project not more than 10 inches (254 mm) beyond the street line when more than 10 feet (3048 mm) above the ground or sidewalk level.

**Exceptions:**

1. Replacement or restoration of historical architectural details that are, or were, located more than 10 feet (3048 mm) above the sidewalk and that project more than 10 inches (254 mm), on existing buildings or structures designated by the Landmarks Preservation Commission, may be permitted provided they do not exceed the historic projections and provided that they are approved by the Landmarks Preservation Commission.
2. New architectural details on new or existing buildings, additions or structures subject to the jurisdiction of the Landmarks Preservation Commission, that are more than 10 feet (3048 mm) above the sidewalk and that project more than 10 inches (254 mm) and no more than 3 feet (914 mm), may be permitted provided that the Landmarks Preservation Commission finds that the proposed detail is appropriate to the historic character of the historic district or landmarked building, structure or site.

**3202.2.1.3 Balconies.** Balconies, including railings and supporting brackets, no parts of which are less than 10 feet (3048 mm) above the ground or sidewalk level, may be constructed to project not more than 2 feet 6 inches (762 mm) beyond the street line. When permitted by the provisions of this code, fire escapes that are part of a required exit may be constructed to project not more than 4 feet 6 inches (1372 mm) beyond the street line provided no part, including any movable ladder or stair, is lower than 10 feet (3048 mm) above the ground or sidewalk level when not in use.

**3202.2.1.4 Marquees.** Marquees may be constructed to project beyond the street line provided that they comply with Section 3106 and Sections 3202.2.1.4.1 through 3202.2.1.4.5.

**3202.2.1.4.1 Height.** Marquees shall receive structural support only from the building and shall be at

least 10 feet (3048 mm) above the ground level or sidewalk.

**3202.2.1.4.2 Projection.** Marquees shall project no closer to the curb line than 2 feet (610 mm).

**3202.2.1.4.3 Thickness.** Marquees shall be no thicker nor shall the fascia be higher than 3 feet (914 mm) when measured vertically from its lowest to its highest point.

**3202.2.1.4.4 Dimensions.** Dimensions shall include all decoration but shall exclude any tension supports suspending the marquee from the wall.

**3202.2.1.4.5 Occupancy restrictions.** Marquees may be erected on:

1. Buildings of an essentially public nature, including but not limited to the following:
  - 1.1. Public buildings, including schools.
  - 1.2. Theatres.
  - 1.3. Hotels.
  - 1.4. Terminals.
  - 1.5. Large department stores.
  - 1.6. Supermarkets.
  - 1.7. Multiple dwellings.
  - 1.8. Office buildings
2. Warehouses or markets in one of the following established market areas:
  - 2.1. Bronx.
    - 2.1.1. Edgewater Road and Halleck Street between Lafayette Avenue and East Bay Avenue.
    - 2.1.2. Lafayette Avenue between Edgewater Road and the Bronx River.
    - 2.1.3. East Bay Avenue between Halleck Street and the Bronx River.
    - 2.1.4. Hunt's Point Avenue between East Bay Avenue and the Bronx River.
    - 2.1.5. Exterior Street between East 149th Street and East 157th Street.
    - 2.1.6. Cromwell Avenue between East 150th Street and East 153rd $\frac{1}{2}$  Street.
    - 2.1.7. East 150th Street between Exterior Street and River Avenue.
    - 2.1.8. Westchester Avenue between St. Ann's Avenue and Bergen Avenue.
    - 2.1.9. Brook Avenue between East 150th Street and East 156th Street.

2.1.10. Bergen Avenue between East 149th Street and East 156th Street.

2.1.11. East 152nd Street between Bergen Avenue and Brook Avenue.

2.1.12. East 153rd $\frac{1}{2}$  Street between Bergen Avenue and Brook Avenue.

## 2.2. Brooklyn.

2.2.1. North 6th Street between Berry Street and Wythe Avenue.

## 2.3. Manhattan.

2.3.1. John Street to Fulton Street between South Street and Front Street.

2.3.2. Fulton Street to Dover Street between South Street and Water Street.

2.3.3. South Street and Front Street between John Street and Dover Street.

2.3.4. Water Street between Fulton Street and Dover Street.

2.3.5. Horatio Street to West 14th Street between West Street and 9th Avenue.

2.3.6. West Street, Washington Street, Greenwich Street.

2.3.7. 9th Avenue and 10th Avenue between Horatio Street and West 14th Street.

2.3.8. West 16th Street, north side, and West 17th Street, south side, between 10th Avenue and 11th Avenue.

2.3.9. West 24th Street to West 26th Street, south side, between 11th Avenue and 12th Avenue.

2.3.10. West 27th Street, north side, to West 28th Street between 11th Avenue and 12th Avenue.

2.3.11. 12th Avenue and St. Claire Place between 125th Street and 132nd Street.

2.3.12. 12th Avenue, west side, between 132nd Street and 133rd Street.

## 2.4. Queens.

2.4.1. 95th Avenue, north side, between Sutphin Boulevard and 148th Street.

**3202.2.1.4.6 Change of occupancy.** When the occupancy or use of a building with a marquee is changed to an occupancy or use for which a project-



ing marquee is not permitted, the marquee shall be removed.

**Exception:** For buildings subject to the jurisdiction of the Landmarks Preservation Commission, Section 3202.2.1.4.6 shall not apply when the Landmarks Preservation Commission makes a determination that the removal of the marquee would be inappropriate to the architectural character of the building or historic district.

**3202.2.1.4.7 Other agency approvals.** An applicant wishing to erect a marquee shall provide proof that the Commissioners of the Departments of Transportation, Consumer Affairs, and Environmental Protection have not permitted the use of a space or structure on or under the sidewalk beneath the proposed marquee in such a manner that the construction of the proposed marquee shall interfere with the removal or repair of any such permitted use or structure.

**3202.2.1.5 Light fixtures.** Light fixtures that are supported entirely from the building may be constructed to project not more than 2 feet (610 mm) beyond the street line, provided no part of the fixture is less than 8 feet (2438 mm) above the ground or sidewalk level.

**3202.2.1.6 Flagpoles.** Flagpoles that are supported entirely from the building may be constructed to project not more than 18 feet (5486 mm) beyond the street line, but not closer than 2 feet (610 mm) to the curb line, provided that no part of the flagpole is less than 15 feet (4572 mm) above the ground or sidewalk level.

**3202.2.1.7 Wall signs.** Wall signs may be constructed to project not more than 12 inches (305 mm) beyond the street line when conforming to the requirements of this code and Section H111 of Appendix H.

**3202.2.1.8 Projecting signs.** All permitted projecting signs may be constructed to project not more than 10 feet (3048 mm) beyond the street line, but not closer to the curb line than 2 feet (610 mm), when conforming to the requirements of this code and Section H112 of Appendix H, and provided that no part of the sign is less than 10 feet (3048 mm) above the ground or sidewalk level.

**Exceptions:** Permanent projecting signs are prohibited on buildings in the areas indicated below:

1. Borough of Manhattan.

1.1. Projecting signs. No permanent projecting sign shall be erected on any building on:

- 1.1.1. 5th Avenue between Washington Square north and 110th Street;
- 1.1.2. 34th Street between Park Avenue and 7th Avenue;
- 1.1.3. Madison Avenue between 23rd Street and 96th Street;
- 1.1.4. 57th Street between Lexington Avenue and Broadway;

1.1.5. Vanderbilt Avenue between 42nd Street and 47th Street;

1.1.6. Park Avenue between 32nd Street and 40th Street;

1.1.7. Park Avenue between 45th Street and 96th Street;

1.1.8. 33rd Street between Lexington Avenue and 5th Avenue;

1.1.9. 35th through 41st Streets between Lexington Avenue and 5th Avenue;

1.1.10. 43rd through 56th Streets between Lexington Avenue and 5th Avenue;

1.1.11. 58th Street between Lexington Avenue and 5th Avenue;

1.1.12. 60th Street between Lexington Avenue and 5th Avenue;

1.1.13. Nassau Street between Wall Street and Frankfort Street; or

1.1.14. John Street between Broadway and William Street.

1.2. Illuminated projecting signs. No permanent illuminated projecting sign shall be erected on any building on:

1.2.1. 72nd Street between Central Park West and River Drive.

2. Borough of Brooklyn.

2.1. Projecting signs. No permanent projecting sign shall be erected on any building on:

2.1.1. Fulton Street between Flatbush Avenue and Joralemon Street and Willoughby Street.

2.2. Illuminated projecting signs. No permanent illuminated projecting sign shall be erected on any building on:

2.2.1. Fulton Street between Flatbush Avenue and Prospect Street and Henry Street;

2.2.2. Washington Street between Myrtle Avenue and Prospect Street;

2.2.3. Court Street between Fulton Street and Livingston Street;

2.2.4. Pierrepont Street between Fulton Street and Clinton Street;

2.2.5. Montague Street between Court Street and Clinton Street;

2.2.6. Remsen Street between Court Street and Clinton Street; or

2.2.7. Joralemon Street between Court Street and Clinton Street.

**3202.2.1.9 Sun control devices.** Sun control devices constructed in accordance with Section 3105 and supported entirely from the building may project beyond the street line not more than 2 feet 6 inches (762 mm),

provided that no part of the sun control device is less than 8 feet (2438 mm) above the ground or sidewalk level. Any portion of a sun control device that is located over a sidewalk vault and is more than 10 inches (254 mm) beyond the street line and less than 40 feet above the ground or sidewalk shall be removable or retractable to less than 10 inches (254 mm) beyond the street line.

### 3202.2.2 Encroachments not subject to area limitations.

**3202.2.2.1 Ramps.** When a building erected prior to December 6, 1969, is altered to provide access to individuals who use wheelchairs, ramps constructed to provide such access may, with the approval of the commissioner, project beyond the street line for a distance of not more than 44 inches (1118 mm). Ramps shall comply with the applicable provisions of Chapter 11.

**3202.2.2.2 Bridges between buildings.** Bridges connecting buildings and projecting beyond street lines may be permitted in accordance with applicable law. Such bridges shall be of a construction class that is at least equal to the higher class of the two buildings connected and shall otherwise comply with the provisions of this code and other applicable laws and rules.

**3202.2.2.3 Flood shield supports.** In areas of special flood hazard or shaded X-Zones, permanent attachments to building façades necessary for the support and attachment of temporary, removable dry floodproofing barriers or shields may be constructed to project beyond the street line for a distance of not more than 6 inches (152 mm).

**3202.2.2.4 Curb cuts.** The lowering of any curb or the change of grade of any sidewalk for the purpose of providing a driveway across such curb or sidewalk shall be constructed in accordance with the specifications prescribed in Sections 406.7.6 and 406.7.7. All sidewalks and driveways or portions thereof that are structurally supported shall be designed for loads prescribed in Chapter 16.

**3202.2.2.4.1 Curb cut removal.** Vehicular access curb cuts that can no longer serve as vehicular access across a curb or sidewalk shall be removed and the curb and sidewalk shall be restored in accordance with standards of the Department of Transportation. The commissioner may order such removal and restoration. The commissioner shall limit the length of any curb cut for the purpose of providing a driveway across such curb or sidewalk, when in the opinion of the commissioner the actual use or intended use of such driveway would endanger the public. Where the vehicular use of such driveway, in the opinion of the commissioner is dangerous to the public, the commissioner shall order the owner to discontinue use of such driveway and restore the curb and sidewalk in accordance with

standards of the Department of Transportation. Upon the failure of the owner to comply with any of the orders provided for in Section 3202.2.2.4, in such cases where the restoration of such curb cuts are needed to facilitate department of transportation work, the commissioner may inform the commissioner of transportation of such failure to comply and may request the cooperation of the commissioner of transportation acting under his or her authority pursuant to Section‡ 2903(b)(7) of the New York City Charter in the enforcement of this section.

**3202.2.3 Awnings.** Awnings constructed in accordance with Section 3105 and supported entirely from the building may project beyond the street line as follows:

**3202.2.3.1 Store front awnings.** Store front awnings may project beyond the street line not more than 8 feet (2438 mm), provided no part of the awning is less than 8 feet (2438 mm) above the ground or sidewalk level, except for a flexible valance which may be not less than 7 feet (2134 mm) above the ground or sidewalk level, and provided that the awning box or cover does not project more than 12 inches (305 mm).

**3202.2.3.2 Awnings over windows or doors.** Awnings over windows or doors may project beyond the street line not more than 5 feet (1524 mm), provided that no part of the awning is less than 8 feet (2438 mm) above the ground or sidewalk level.

### 3202.2.4 Reserved.‡

**3202.2.5 Fire department connections, caps or plugs.** Fire department connection swivels, caps and plugs shall be permitted to project beyond the street line as provided for in NFPA 14, as amended by Appendix Q of this code.

### 3202.3 Reserved.

**3202.4 Temporary encroachments.** Encroachments of temporary nature shall comply with Sections 3202.4.1 and 3202.4.3.

**3202.4.1 Sidewalk cafés.** Enclosures for sidewalk cafés, where permitted by the Commissioner of the Department of Consumer Affairs pursuant to applicable law and constructed in compliance with Section 3111, may be constructed beyond the street line.

**3202.4.2 Storm enclosures.** Storm enclosures projecting not more than 18 inches (457 mm) beyond the street line may be permitted during the period between November 15 and the following April 15. Such enclosures shall be removed at the end of this period. Construction of storm enclosures must comply with the requirements of this code including the fire-resistance rating of the building to which it is appurtenant and Chapter 11 of this code.

**3202.4.3 Temporary flood shields, stairs and ramps in areas of special flood hazard and shaded X-Zones.** In areas of special flood hazard and shaded X-Zones, temporary flood shields, stairs and ramps shall comply with Sections G308.6 and G308.7 of Appendix G of the *New York*

## ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY

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*City Building Code* and shall be permitted in accordance with plans approved by the department subject to the following conditions:

1. Such flood shields, stairs and ramps shall project no more than one foot (305 mm) beyond the street line.
2. Such flood shields, stairs and ramps shall be removed in a timely manner after a flood event.

[illegible]



**3301.8 Accidents and damage to adjoining property.** The department shall be notified immediately by the permit holder, or a duly authorized representative, of an accident at a construction or demolition site, or of any damage to adjoining property caused by construction or demolition activity at the site.

**3301.8.1 Use and tampering prohibited.** Following an accident, no person shall permit any of the following without the permission of the commissioner, or without a lawful order from the New York City Police or Fire Department:

1. Use or operation of any equipment or structure damaged or involved in the accident; or
2. Removal or alteration of any equipment, structure, material, or evidence related to the accident.

**Exception:** Immediate emergency procedures taken to secure structures, temporary construction, operations, or equipment that pose a continued imminent danger or to facilitate assistance for persons who are trapped or who have sustained bodily injury.

**3301.9 Required signs.** Signs shall be posted at a construction or demolition site in accordance with Sections 3301.9.1 through 3301.9.5.

**3301.9.1 Fence project information panel.** Where a site is enclosed with a fence in accordance with Section 3307.7, a project information panel meeting the requirements of Sections 3301.9.1.1 through 3301.9.1.6 shall be posted. Required project information panels shall be in place throughout the duration that the fence remains at the site.

**Exceptions:**

1. At a site where the project permit was issued or renewed prior to July 1, 2013, signs meeting the requirement of Section 3301.9.3 may be posted in lieu of a project information panel. Such signs shall be removed and a project information panel in accordance with the requirements of this section installed upon date of the first permit renewal on or after July 1, 2013.
2. Project information panels at government-owned sites or at sites with government funding, may be modified in accordance with department rule.
3. Signs posted at construction or demolition sites for one-, two- or three-family dwellings may comply with Section 3301.9.3 in lieu of this section.

**3301.9.1.1 Project information panel content.** Project information panels shall contain the following information:

1. A rendering, elevation drawing, or zoning diagram of the building exterior that does not contain logos or commercially recognizable symbols;
2. A title stating "Work in Progress:" and specifying the intended type(s) of zoning use(s) (e.g. Resi-

dential, Commercial, Manufacturing, Retail, Office, Hospital, School);

3. Anticipated project completion date;
4. The corporate name, address, and telephone number of the owner of the property;
5. Website address or phone number to contact for project information;
6. The corporate name and telephone number of the general contractor, or for a demolition site, the demolition contractor;
7. The statement, in both English and Spanish, "TO ANONYMOUSLY REPORT UNSAFE CONDITIONS AT THIS WORK SITE, CALL 311."; and
8. A copy of the primary project permit, with accompanying text "To see other permits issued on this property, visit: [www.nyc.gov/buildings](http://www.nyc.gov/buildings)." The permit shall be laminated or encased in plastic covering to protect it from the elements or shall be printed directly onto the project information panel.

**Exception:** A rendering, elevation drawing, or zoning diagram of the building exterior is not required for demolition projects.

**3301.9.1.2 Posting of project information panels.** A project information panel shall be posted on the fence on each perimeter fronting a public thoroughfare. Where such perimeter is more than 150 feet (45 720 mm) in length, a project information panel shall be posted at each corner. Such panels shall be posted on the fence at a height of 4 feet (1219 mm) above the ground, with such distance measured from the ground to the bottom edge of the panel.

**3301.9.1.3 Project information panel material.** Project information panels shall be constructed out of a durable and weatherproof material such as vinyl, plastic, or aluminum, and such material shall be flame retardant in accordance with NFPA 701 or listed under UL 214.

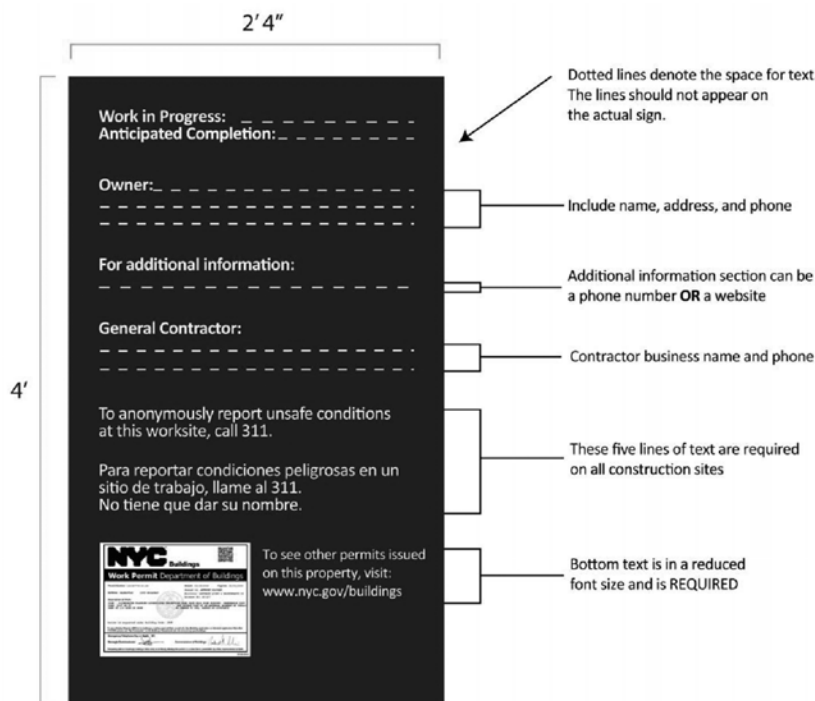
**3301.9.1.4 Project information panel specifications.** Project information panels shall be 6 feet (1829 mm) wide and 4 feet (1219 mm) high, with the content required by Section 3301.9.1.1 arranged in accordance with Figures 3301.9.1.4(1) and 3301.9.1.4(2). The content required by Section 3301.9.1.1, Items 2 through 7 shall be written in the Calibri font or similar sans serif font style, with letters a minimum of 1 inch (25 mm) high, as measured by the upper case character. Such letters shall be white, on a blue background, with such blue color of a shade matching Pantone 296, or RGB 15, 43, 84, or CMYK 100, 88, 38, 35.

**Exceptions:**

1. The dimensions for a project information panel posted in conjunction with a demolition project shall be 2 feet 4 inches (711 mm) wide

posted in conjunction with a demolition project, shall be 55 inches (1397 mm) wide and 36.5 inches (927 mm) high, in accordance with Figure 3301.9.1.4(3).

2. For construction sites with a street frontage less than 60 feet (18 288 mm), the dimensions for a project information panel, other than that



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.±

**FIGURE 3301.9.1.4(1)**  
**FENCE PROJECT INFORMATION PANEL TEXT DETAIL**



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.†

**FIGURE 3301.9.1.4(2)**  
**FENCE PROJECT INFORMATION PANEL LAYOUT**



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.†

**FIGURE 3301.9.1.4(3)**  
**FENCE PROJECT INFORMATION PANEL LAYOUT FOR SMALL LOTS**

**3301.9.1.5 Updating content.** When content required by Section 3301.9.1.1 changes, the project information panel shall be updated.

**3301.9.1.6 Maintenance of project information panels.** Project information panels shall be maintained so that the panel remains legible, securely attached, and free of sharp edges, protruding nails, or similar hazards. Content required by Section 3301.9.1.1 shall not be obscured by panel attachments, including but not limited to grommets or grommet holes.

**3301.9.2 Sidewalk shed parapet panel.** Where a sidewalk shed is installed, a sidewalk shed parapet panel meeting the requirements of Sections 3301.9.2.1 through 3301.9.2.6 shall be posted. Required sidewalk shed parapet panels shall be in place throughout the duration that the sidewalk shed remains at the site.

**Exceptions:**

1. At a site where the sidewalk shed permit was issued or renewed prior to July 1, 2013, signs meeting the requirement of Section 3301.9.4 may be posted in lieu of a sidewalk shed parapet panel. Such signs shall be removed and a sidewalk shed parapet panel in accordance with the requirements of this section installed upon date of the first permit renewal on or after July 1, 2013.
2. Signs posted at construction or demolition sites for one-, two- or three-family dwellings may comply with Section 3301.9.4 in lieu of this section.

**3301.9.2.1 Sidewalk shed parapet panel content.** Sidewalk shed parapet panels shall comply with the requirements of either section 3301.9.2.1.1 or 3301.9.2.1.2., as applicable:

**3301.9.2.1.1 Sidewalk shed parapet panel content for sites not included in a best construction site management program.** Sidewalk shed parapet panels not included in a best construction site management program shall contain the following information and be arranged in accordance with Figure 3301.9.2.1(1):

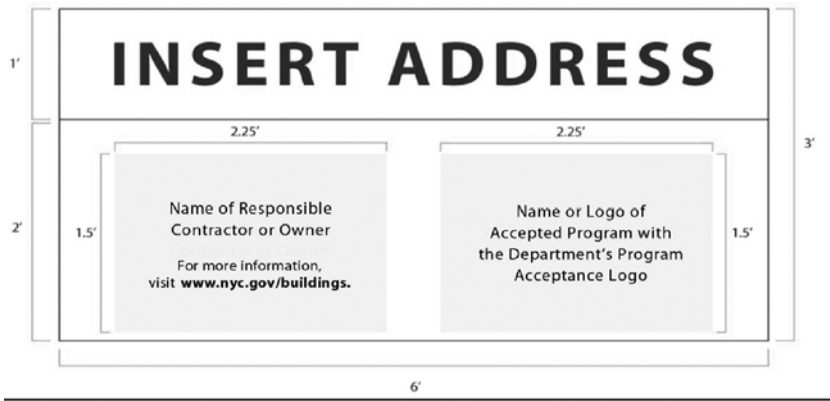
1. The street address of the site;
2. Name (which may incorporate a logo) of the contractor responsible for the site or where there is no contractor, the name (which may incorporate a logo) of the owner of the site; and
3. The statement "For more information, visit [www.nyc.gov/buildings](http://www.nyc.gov/buildings)."

**3301.9.2.1.2 Sidewalk shed parapet panel content for sites included in a best construction site management program.** In addition to the requirements of section 3301.9.2.1.1, for site maintained in accordance with a best construction site management program accepted by the commissioner as set forth in Section 3301.9.2.7, either the name or logo of such program, with the department's program acceptance logo, may be placed on the sidewalk shed parapet panel in accordance with Figure 3301.9.2.1(2).



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.‡

FIGURE 3301.9.2.1(1)  
SIDEWALK SHED PARAPET PANEL LAYOUT



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.‡

FIGURE 3301.9.2.1(2)  
SIDEWALK SHED PARAPET PANEL LAYOUT FOR ACCEPTED SITE MANAGEMENT PROGRAMS

- 3301.9.2.2 Posting of sidewalk shed parapet panels.** Sidewalk shed parapet panels shall be posted on the parapet that runs along the long axis of the sidewalk shed. Such sign:
1. Shall not be posted above or below the level of the parapet; and
  2. Shall be posted at least 3 feet (914 mm) and no more than 6 feet (1828 mm) from the left edge of the sidewalk shed parapet, as viewed from the perspective of an individual on the sidewalk

- opposite the long axis of the sidewalk shed and facing the sidewalk shed; or
3. Where a project information panel in accordance with Section 3301.9.1 is posted on the fence, the horizontal center of the sidewalk shed parapet panel shall be in line with a vertical plane drawn through the horizontal center of the project information panel and the sidewalk shed parapet shall be posted in accordance with Figure 3301.9.2.2.





FIGURE 3301.9.2.2  
PANEL POSTING ELEVATION DIAGRAM

### 3301.9.2.3 Sidewalk shed parapet panel material.

Sidewalk shed parapet panels shall be constructed out of a durable and weatherproof material such as vinyl, plastic, or aluminum, and such material shall be flame retardant in accordance with NFPA 701 or listed under UL 214.

**3301.9.2.4 Sidewalk shed parapet panel specifications.** Sidewalk shed parapet panels shall be 3 feet (914 mm) high and 6 feet (1829 mm) wide, with the content required by Section 3301.9.2.1 arranged in accordance with Figures 3301.9.2.1(1) or 3301.9.2.1(2). The sign shall have a white background. The content required by item number 1 of Section 3301.9.2.1.1 must be written in Calibri font or similar sans serif font style, and such letters shall be blue color a shade matching Pantone 296, or RGB 15, 43, 84, or CMYK 100, 88, 38, 35.

**3301.9.2.5 Updating content.** When content required by Section 3301.9.2.1 changes, the sidewalk shed parapet panel shall be updated.

**3301.9.2.6 Maintenance of sidewalk shed parapet panels.** Sidewalk shed parapet panels shall be maintained so that the panel remains legible, securely attached, and free of sharp edges, protruding nails, or similar hazards. Content required by Section 3301.9.2.1 shall not be obscured by sign attachments, including but not limited to grommets or grommet holes.

**3301.9.2.7 Best construction site management program.** The department shall have the authority to create standards established by rule for the acceptance of a

program that ensures best construction site management practices, and to set forth the basis and process for removal of such acceptance and for the removal of the program's name and logo from the sidewalk shed parapet panel located at a particular site.

**3301.9.3 Existing fence signs and signs at construction or demolition sites for one-, two- or three-family dwellings.** Where a site is enclosed with a fence in accordance with Section 3307.7, and a project information panel is not required in accordance with Section 3301.9.1, a sign or signs meeting the requirements of Section 3301.9.3.1 through 3301.9.3.3 shall be posted. Required signs shall be in place throughout the duration that the fence remains at the site.

**3301.9.3.1 Sign content and posting.** One or more signs needed to accommodate the following information shall be posted on the fence on each perimeter fronting a public thoroughfare at a height of no more than 12 feet (3658 mm) above the ground, with such distance measured from the ground to the top of the sign:

1. The name, address, and telephone number of the owner of the property;
2. The name, address, and telephone number of the general contractor, or for a demolition site, the demolition contractor; and
3. The statement, in both English and Spanish, "TO ANONYMOUSLY REPORT UNSAFE CONDI-

TIONS AT THIS WORK SITE THAT ENDANGER WORKERS, CALL 311.”

**3301.9.3.2 Maintenance of fence signs.** Fence signs shall be maintained so that the sign remains legible, securely attached, and free of sharp edges, protruding nails, or similar hazards.

**3301.9.3.3 Fence sign specifications.** Fence signs shall be constructed of  $\frac{3}{4}$ -inch (19 mm) plywood or material of equivalent strength, durability and weatherproofing, including but not limited to sheet metal, aluminum, vinyl, or plastic. The letters on such signs shall be black on a white background. Such signs shall be no larger than that needed to accommodate the information required by Section 3301.9.3.1 in letters no less than 3 inches (76 mm) high.

**3301.9.4 Existing sidewalk shed signs and signs at construction or demolition sites for one-, two- or three-family dwellings.** Where a sidewalk shed is installed, and a sidewalk shed parapet panel is not required in accordance with Section 3301.9.2, a sign readily visible from the street shall be posted on the parapet that runs along the long axis of the sidewalk shed. Such sidewalk shed sign shall be in place throughout the duration that the sidewalk shed remains at the site. Such sidewalk shed sign shall include:

1. The corporate name, address, and telephone number of the sidewalk shed permit holder;
2. The sidewalk shed permit number; and
3. The expiration date of the sidewalk shed permit.

**3301.9.5 Other signs.** Signs required by law to be displayed at a construction or demolition site shall be posted within the site, readily visible to workers, and shall not be posted in any location readily visible to the public unless otherwise required by law.

**3301.10 Obscured lawful signs.** When a protective structure is constructed in accordance with Section 3307, a temporary sign may be posted on such protective structure when the structure is adjacent to any building and obscures from view a lawful and existing sign. The temporary sign shall comply with the following requirements:

1. The temporary sign shall be securely fastened to the face of the protective structure at a location directly in front of such business storefront;
2. No projecting temporary signs shall be permitted, and all temporary signs shall be limited to a maximum height of 4 feet (1219 mm), and when affixed to a sidewalk shed, shall not project above the parapet;
3. No temporary signs shall be permitted on the ends of any protective structure, unless the lawful and existing sign would otherwise be obscured from view by a deck or parapet of a sidewalk shed or bridge; and
4. No temporary signs shall project below the deck of any sidewalk shed.

## SECTION BC 3302 DEFINITIONS

**3302.1 Definitions.** The following words and terms shall, for the purposes of this chapter, have the following meanings.

**ACCIDENT.** An occurrence directly caused by construction or demolition activity or site conditions that result in one or more of the following:

1. A fatality to a member of the public;† or
2. Any type of injury to a member of the public; or
3. A fatality to a worker; or
4. An injury to a worker that requires transport by emergency medical services or requires immediate emergency care at a hospital or offsite medical clinic; or
5. Any complete or partial structural collapse or material failure; or
6. Any complete or partial collapse or failure of pedestrian protection, scaffolding, hoisting equipment, or material handling equipment; or

Any material fall exterior to the building or structure.

**ADJUSTMENT (SCAFFOLD).** The calibration or modification of a scaffold, including any part or component, that does not meet the definition of installation, removal, repair, maintenance, or use, and does not constitute normal use or operation of the scaffold.

**ALTERATION.** See Section 28-101.5 of the *Administrative Code*.

**ARCHITECT.** See Section 28-101.5 of the *Administrative Code*.

**ARTICULATING BOOM CRANE.** A power-operated machine for lifting or lowering a load and moving it horizontally that utilizes a boom consisting of a series of folding pin connected structural members, typically manipulated to extend or retract by power from hydraulic cylinders, with or without a hoisting mechanism integral to the machine.

**AXIS OF ROTATION.** The vertical axis around which the crane superstructure rotates.

**AXLE.** The shaft or spindle with which or about which a wheel rotates. On truck and wheel mounted cranes, it refers to an automotive type of axle assembly, including housing, gearing, differential, bearings and mounting appurtenances.

**BASE (MOUNTING).** The base or carrier on which the rotating superstructure is mounted, such as a truck, crawler or platform.

**BEARER (PUTLOG).** A horizontal transverse scaffold member (which may be supported by legs or runners) upon which the scaffold platform rests and joins scaffold uprights, posts, poles, and similar members.

**BOOM.** A section or strut, of which the heel (lower end) is affixed to abase, carriage or support, and whose upper end supports a cable and sheaves where the load is lifted by means of wire rope and a hook.

**BOOM POINT.** The outward end of the top section of the boom, containing the hoist sheave assembly.

**BRAKE.** A device used for retarding or stopping motion by friction or power means.

**BUCKET HOIST.** A power- or manually operated suspended bucket contained by guide rails used for raising or lowering material, exclusively and is controlled from a point outside the conveyance.

**CABLEWAY.** A power-operated system for moving loads in a generally horizontal direction in which the loads are conveyed on an overhead cable, track or carriage.

**CERTIFICATE OF APPROVAL.** A certificate issued by the department upon review and approval of the engineering and testing of a specific make and model of hoisting equipment to ensure compliance with the applicable provisions of this code and its referenced standards

**CERTIFICATE OF OPERATION.** A certificate issued by the department annually upon satisfactory inspection of the hoisting equipment holding a certificate of approval to ensure that the equipment continues to be in compliance with this code and its referenced standards.

**CERTIFICATE OF ON-SITE INSPECTION.** A certificate issued by the department based on a site-specific approval of the placement, founding and operation of hoisting equipment.

**CLAMSHELL.** A shovel bucket with two jaws that clamp together by their own weight when it is lifted by a closing line.

**CLIMBING/JUMPING.** The raising or lowering of a tower or climber crane to different floors or levels of a building or structure.

**COMMERCIAL TRUCK MOUNTED CRANE (BOOM TRUCK).** A crane consisting of a rotating superstructure (center post or turntable), boom, operating machinery, and one or more operator's stations mounted on a frame attached to a commercial truck chassis, usually retaining a payload hauling capability whose power source usually powers the crane. Its function is to lift, lower, and swing loads at various radii.

**COMPETENT PERSON.** One who is capable of identifying existing predictable hazards in the surroundings or conditions that are unsanitary, hazardous or dangerous, and who has authorization to take prompt corrective measures to eliminate such hazards.

**CONCRETE WASHOUT WATER.** Wastewater from the rinsing of equipment used to mix, transport, convey, and/or place concrete. Such equipment shall include, but not be limited to, concrete buckets, concrete hose lines and pumps, boots, shovels, finishing tools, wheelbarrows, motorized concrete carts, concrete pour funnels and the chute of concrete mixer trucks.

#### Exceptions:

1. This term shall not include wastewater from the rinsing of equipment involved in the preparation, conveyance or application of concrete that is:

- 1.1. mixed on site if the total quantity of concrete is less than or equal to one and one half cubic yards (1.146 m<sup>3</sup>), or

- 1.2. from bagged ready mix if the total quantity of concrete is less than or equal to sixty (60) eighty pound (36.287 kg) bags, or eighty (80) sixty pound (27.215 kg) bags, or the equivalent.

2. This term shall not include wastewater from the rinsing of the wheels, undercarriage or chassis of concrete mixer trucks.

**CONSTRUCTION.** The excavation, erection, alteration, and repair of buildings or any component parts, including all operations incidental thereto.

**CORNER SCAFFOLD (ANGLE SCAFFOLD).** A suspended scaffold consisting of an assembly of two or more platforms connected nonlinearly and designed and manufactured to fit around a corner or a projecting part of a building.

**COUNTERWEIGHT.** Weight used to supplement the weight of the machine in order to provide stability for lifting loads.

**CRANE.** A power-operated machine for lifting or lowering a load and moving it horizontally which utilizes wire rope and in which the hoisting mechanism is an integral part of the machine. The definition of a crane shall also include articulating boom crane, regardless of whether it has a hoisting mechanism integral to the machine.

**CRAWLER CRANE.** A crane consisting of a rotating superstructure with a power plant, operating machinery, and boom, mounted on a base and equipped with crawler treads for travel. Its function is to lift, lower, and swing loads at various radii.

**CRITICAL PICK.** The attachment and detachment of loads from the hook of hoisting equipment used to hoist or lower loads on the outside of a building that involves one or more of the following:

1. An article that is at or above 95 percent of approved rated capacity of the hoisting equipment or rigging equipment;
2. An article that is asymmetrical and is not provided with standard rigging ears;
3. An article that has a wind sail area exceeding 500 square feet (46 m<sup>2</sup>)±;
4. A pick that may present an added risk because of clearance, drift, or other interference;
5. An article that is fragile or of thin shell construction and is not provided with standard rigging ears;
6. A pick that requires multiple power-operated hoisting equipment (tandem pick); or
7. A pick that requires out of the ordinary rigging equipment, methods, or setup.



**DEBRIS.** Rubbish, waste, discarded material, or the remains of something broken down, demolished, or destroyed.

**DEBRIS NET or NETTING.** A netting of a fine mesh of a size and strength sufficient to catch debris, such as falling tools and materials.

**DEMOLITION.** Full or partial demolition.

**Full demolition.** The dismantling, razing, or removal of all of a building or structure, including all operations incidental thereto.

**Partial demolition.** The dismantling, razing, or removal of structural members, floors, interior bearing walls, and/or exterior walls or portions thereof, including all operations incidental thereto.

**DERRICK.** An apparatus consisting of a mast or equivalent member held at the end by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes, for lifting or lowering a load and moving it horizontally.

**DEWATERING.** The removal of surface or ground water from a site by pumping or evaporation.

**DIRECT AND CONTINUING SUPERVISION.** See Section 28-401.3 of the *Administrative Code*.

**DIRECT EMPLOY.** See Section 28-401.3 of the *Administrative Code*.

**DISMANTLING.** The final process of taking apart, piece by piece, in a specific sequence, the components of a crane. Dismantling shall include climbing and jumping.

**DRUM.** The cylindrical member around which a rope is wound for raising and lowering the load or boom.

**ENGINEER.** See Section 28-101.5 of the *Administrative Code*.

**EQUIPMENT.** Implements used to facilitate construction or demolition work.

**ERECTION.** The assembly and placement of crane sections and components into place, including all operations incidental thereto. Erection shall include climbing and jumping.

**EXCAVATION.** The removal of earth from its natural position; except for any incidental removal that occurs during the course of auguring, drilling, vibrating, or driving.

**GUARDRAIL SYSTEM (SCAFFOLD).** A vertical barrier as described in Section 3314.8 consisting of, but not limited to, toprails, midrails and posts, erected to prevent falling from a scaffold platform or walkway to lower levels.

**GUY.** A rope used to steady or secure the mast or other members in the desired position.

**HANDHELD DEVICE (DEMOLITION).** Equipment, mechanical or nonmechanical, utilized to physically demolish a building or structure, or elements of a building or structure, that is held, lifted, moved, and operated by a single person. A handheld device shall also include any item accessory to such

equipment, including but not limited to a compressor, regardless of if such accessory item is held, lifted, moved, and operated by a single person. A handheld device does not include remote controlled equipment.

**HEAVY DUTY SCAFFOLD.** A supported scaffold capable of supporting loads of up to 75 pounds per square foot ( $366.15 \text{ kg/m}^2$ ), and not more than those imposed by workers and heavy material, including but not limited to stone.

**HEAVY DUTY SIDEWALK SHED.** A sidewalk shed designed to carry a live load of at least 300 pounds per square foot ( $1465 \text{ kg/m}^2$ ).

**HISTORIC STRUCTURE.** A building or structure which is a designated New York City landmark or interior landmark, is located within a designated New York City historic district, or is listed on the New York State or National Register of Historic Places.

**HOISTING EQUIPMENT.** Equipment used to raise and lower personnel and/or material with intermittent motion. Hoisting equipment does not include scaffolds, mast climbers, and elevators.

**HOISTING MACHINE.** A power operated machine used for lifting or lowering a load, utilizing a drum and a wire rope, excluding elevators. This shall include but not be limited to a crane, derrick, cableway and hydraulic lifting system, and articulating booms.

**HOISTING MECHANISM.** A hoist drum and rope reeving system used for lifting and lowering loads.

**INDUSTRIAL ROPE ACCESS.** The use or rope access equipment in which a person descends or ascends on a rope, or traverses along a rope, and in which the ropes are used as the primary means of support and positioning. Industrial rope access does not include window washing.

**INSTALLING/INSTALLATION/INSTALL (SCAFFOLD).** The initial installation or reinstallation of a scaffold at a site.

**Initial installation (scaffold).** The initial assembly, set-up, or placement of a scaffold at a site.

**Reinstallation (scaffold).** The addition, relocation, or removal of any part, component, or attachment to a scaffold at a site, including but not limited to counterweights, tie-backs, anchorages, or connections to the building or structure, that occurs subsequent to the initial installation, and which does not otherwise occur in an automated, automatic fashion, as part of the normal use of the scaffold.

**JIB.** An extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles in the vertical plane of the boom.

**JUMP (JUMPING).** The process of adding or removing mast or tower sections to equipment that has already been erected.



**LAY.** That distance measured along a wire rope in which one strand makes one complete helical convolution about the core or center.

**LIGHT DUTY SCAFFOLD.** A supported scaffold capable of supporting loads of up to 25 pounds per square foot (122.05 kg/m<sup>2</sup>), and not more than those imposed by workers and lightweight material, including but not limited to wood or paint.

**LIGHT DUTY SIDEWALK SHED.** A sidewalk shed designed to carry a live load of at least 150 pounds per square foot (732.3 kg/m<sup>2</sup>).

**LOAD (WORKING).** The external load, in pounds (kilograms), applied to the crane or derrick, including the weight of auxiliary load attaching equipment, such as lower load blocks, shackles and slings.

**LOAD RATINGS.** Crane and derrick ratings in pounds (kilograms) established by the manufacturer in accordance with standards set forth in rules promulgated by the commissioner.

**LOAD RATING CHART.** A full and complete range of manufacturer's crane load ratings at all stated operating radii, boom angles, work areas, boom lengths and configurations, jib lengths and angles (or offset), as well as alternative ratings for use and nonuse of optional equipment on the crane, such as outriggers and extra counterweights, that affect ratings.

**LOWER LOAD BLOCK.** The assembly of hook or shackle, swivel, sheaves, pins and frame suspended by the hoisting ropes.

**MAINTENANCE (SCAFFOLD).** Regular or periodic upkeep as specified by the manufacturer to keep the scaffold, including all parts or components, in like new condition and safe working order, and that does not otherwise meet the definition of an installation, removal, or repair.

**MAJOR BUILDING.** An existing or proposed building 10 or more stories or 125 feet (38 100 mm) or more in height, or an existing or proposed building with a building footprint of 100,000 square feet (30 480 m<sup>2</sup>) or more regardless of height, or an existing or proposed building so designated by the commissioner due to unique hazards associated with the construction or demolition of the structure.

**MAST CLIMBER.** A powered device consisting of an elevating platform mounted on a base or chassis and mast, that when erected is capable of supporting personnel, material, equipment and tools on a deck or platform that is capable of traveling vertically in infinitely adjustable increments to reach the desired work level.

**MATERIAL HANDLING EQUIPMENT.** A power or manually operated platform, bucket, car or cage that moves horizontally and is mainly used for transporting material during construction, alteration, repair or demolition of a building or structure.

**MATERIAL HOIST (MATERIAL HOISTING EQUIPMENT).** A power or manually operated platform, bucket,

car or cage that moves vertically and is used for raising or lowering material exclusively during construction, alteration, repair or demolition of a building or structure, and is controlled from a point outside the conveyance.

**MECHANICAL DEMOLITION EQUIPMENT.** Mechanically driven or powered equipment that is utilized to physically demolish a building or structure, or elements of a building or structure, either within or exterior to the building or structure, or that is utilized to move debris or material within the building or structure. Mechanical demolition equipment shall not include mechanically driven or powered equipment that is utilized to move debris or material outside of the building or structure.

**MEDIUM DUTY SCAFFOLD.** A supported scaffold capable of supporting loads of up to 50 pounds per square foot (244.1 kg/m<sup>2</sup>), and not more than those imposed by workers and moderate material, including but not limited to brick and pipe.

**MINOR ALTERATIONS.** See Section 105.4.2 of the *Administrative Code*.

**MOBILE CRANE.** A commercial truck mounted crane, crawler crane, wheel mounted crane (multiple control stations), or wheel mounted crane (single control station).

**MOBILE SCAFFOLD.** A powered or unpowered, portable, caster, track or wheel-mounted supported scaffold.

**MULTIPOINT ADJUSTABLE SUSPENDED SCAFFOLD.** A suspended scaffold consisting of a platform(s) that is suspended by more than two ropes from overhead supports and equipped with a means to raise and lower the platform to the desired work levels.

**ORDINARY REPAIRS.** See Section 105.4.2 of the *Administrative Code*.

**OUTRIGGER (CRANE).** Extendable or fixed members attached to the mounting base that rest on supports at the outer ends used to support the crane.

**OUTRIGGER (SCAFFOLD).** The structural member of a supported scaffold used to increase the base width of a scaffold in order to provide support for and increased stability of the scaffold.

**OUTRIGGER BEAM (THRUSTOUT).** The structural member of a suspended scaffold or outrigger scaffold that provides support for the scaffold by extending the scaffold point of attachment to a point out and away from the structure or building.

**OUTRIGGER SCAFFOLD.** A supported scaffold consisting of a platform resting on outrigger beams (thrustouts) projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside the building or structure.

**PERSONNEL HOIST.** A mechanism and its hoistway, equipped with a car that moves vertically on guide members, used for hoisting or lowering workers or workers and materials for the construction, alteration, or demolition of a building, structure, or other work.

**PLATFORM.** A work surface elevated above lower levels. Platforms can be constructed using individual wood planks, fabricated planks or fabricated decks.

**POWER BUGGIES.** An automotive vehicle designed or used for the transportation of materials on or about construction or demolition sites. It shall not include automobiles, motor trucks, general purpose tractors, or excavating or material handling machinery.

**QUALIFIED PERSON.** A person who by possession of a recognized degree, certificate or professional standing, or who by knowledge, training and experience, has demonstrated his or her ability to solve or resolve problems related to the subject matter, the work or the project.

**REGISTERED DESIGN PROFESSIONAL.** An architect or engineer.

**REMOVING/REMOVAL/REMOVE (SCAFFOLD).** The final process of taking apart a scaffold in a specific sequence and removing it from the site.

**REPAIR (SCAFFOLD).** Work performed to restore a scaffold, or any part or component, to like new condition and safe working order following decay, wear, or damage. The definition of repair shall also include the replacement of a part or component.

**REPLACEMENT (SCAFFOLD).** A repair involving the exchange or substitution of one part or component with another identical or similar part or component in order to restore a scaffold, or any part or component, to like new condition and safe working order following decay, wear, or damage.

**ROPE.** A continuous line of material comprised of a number of twisted or braided strands of fiber (natural or synthetic) or metal wire.

**RUNBACK STRUCTURE.** A temporary system of hoistway landing runways, vertical supports and horizontal diaphragms designed to bridge between the hoistway and the parent structure and to transmit both vertical and horizontal loads to the supporting structure and/or foundation.

**SAFETY NETTING SYSTEM.** Debris or structural nets, installed vertically or horizontally, along with all supports, components, and connections.

**Horizontal safety netting.** A safety netting system, installed horizontally, consisting of structural netting lined with debris netting.

**Vertical safety netting.** A safety netting system, installed vertically, consisting of debris netting.

**SCAFFOLD.** Any temporary elevated platform and its supporting structure (including points of anchorage) used for supporting workers or workers and material, including but not limited to supported scaffolds, suspended scaffolds, and mobile scaffolds.

**SCAFFOLD CONTROLLING ENTITY.** The contractor or other entity that exercises responsibility for the site where the scaffold is located.

**SINGLE-POINT ADJUSTABLE SUSPENDED SCAFFOLD.** A suspended scaffold consisting of a platform suspended by one rope from an overhead support and equipped with means to permit the movement of the platform to desired work levels.

**SOIL AND FOUNDATION WORK (SOIL OR FOUNDATION WORK).** Excavation, fill, grading, augering, or drilling, whether in soil or rock; or the installation or removal of foundations, piles, underpinning, sheeting, shoring, or supports of excavation.

**STANDARD GUARDRAIL SYSTEM (SCAFFOLD).** See "Guardrail system (scaffold)."

**STRIPPING OPERATIONS.** Removal on the floor of any parts of the concrete formwork including shoring, bracing and other supports.

**STRUCTURAL NET (STRUCTURAL NETTING).** A system of nets capable of complying with the prototype test described in ANSI A10.11.

**SUPERSTRUCTURE.** The rotating upper frame structure of the machine and the operating machinery mounted thereon.

**SUPPORTED SCAFFOLD.** One or more platforms supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, including prefabricated frames that are mechanized but not motorized, or any similar rigid support, including back structures connecting hoistways to buildings, and including structures where sidewalk protection is constructed as an integral part of the apparatus.

**SUSPENDED SCAFFOLD.** One or more platforms suspended by ropes or other means from an overhead structure.

**SUSPENDED SCAFFOLD FOREMAN.** An individual, male or female, designated by and working under the direct and continuing supervision of a licensed master or special rigger, or a licensed master or special sign hanger, in accordance with the rules of the department.

**SUSTAINED WIND.** Winds with a 1 minute average duration lasting for a 1-hour period or longer.

**SWING.** Rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.

**TEMPORARY CONSTRUCTION.** Bracing, shoring, or other elements not part of the permanent structure and which are installed to facilitate construction or demolition work.

**TOOL.** See "Equipment."

**TOWER.** A vertical structural frame consisting of columns and bracing that are capable of supporting working and dynamic loads and transmitting them to the support(s).

**TOWER CRANE.** A power-operated hoisting machine that utilizes a vertical tower with a rotating superstructure and includes a load boom (jib) in order to lift or lower a load and move it horizontally.

**TRANSIT.** The moving or transporting of a crane from one job site to another.

**TRAVEL.** The function of the machine moving from one location to another on a job site.

**TWO-POINT SUSPENDED SCAFFOLD (SWING STAGE).** A suspended scaffold consisting of a platform supported by hangers (stirrups) suspended by two ropes from overhead supports and equipped with means to permit the raising and lowering of the platform to desired working levels.

**UNENCLOSED PERIMETER.** Any exterior portion of a building that is not solidly enclosed with the permanent façade, including the windows; or any exterior edge of a roof that is not enclosed with its permanent parapet or guardrail.

**USE/USING (SCAFFOLD).** Any work or activity performed on or from the scaffold. In addition, for a suspended scaffold, the use of the scaffold shall include the operation of the scaffold at the site, provided during such operation any vertical or horizontal relocation of the scaffold does not require a modification to the counterweight, or does not require the placement, relocation, or removal of any anchorage, attachment, outrigger beam, tie-back, or connection to the building or structure.

**WALKABLE FLOOR (CONCRETE CONSTRUCTION).** A floor where the concrete slab has been poured and the formwork stripped.

**WALKABLE FLOOR (PRECAST CONCRETE CONSTRUCTION).** A floor where the frame is erected and the precast concrete floor is fixed in place.

**WALKABLE FLOOR (STEEL CONSTRUCTION).** A floor where the frame is erected and the deck is tack welded or fixed in place.

**WHEEL MOUNTED CRANE (MULTIPLE CONTROL STATIONS).** A crane consisting of a rotating superstructure, operating machinery, and operator's station and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source(s), and having separate stations for driving and operating. Its function is to lift, lower, and swing loads at various radii.

**WHEEL MOUNTED CRANE (SINGLE CONTROL STATION).** A crane consisting of a rotating superstructure, operating machinery, and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source, and having a single control station for driving and operating. Its function is to lift, lower, and swing loads at various radii.

**WORKING DECK (CONCRETE CONSTRUCTION).** The level where the floor is being formed.

**WORKING DECK (DEMOLITION).** The level where the floor is being broken up.

**WORKING DECK (PRECAST CONCRETE CONSTRUCTION).** The level where the floor is being placed.

**WORKING DECK (STEEL CONSTRUCTION).** The floor where the metal decking and steel components are being placed before concrete is poured.

## SECTION BC 3303 SAFEGUARDS AND MAINTENANCE OF SITE

**3303.1 Scope.** Sites shall be safeguarded and maintained in accordance with the provisions of this section to protect the public and property.

**3303.2 Utilities.** Utilities at a site shall meet the requirements of Sections 3303.2.1 through 3303.2.5.

**3303.2.1 Existing services.** The location of all existing utilities and service lines shall be determined and adequate measures taken, or devices provided, to safeguard the public and property before such utilities are disturbed.

**3303.2.2 Maintaining essential services.** See Section 3303.9.

**3303.2.3 Electrical work.** All temporary electrical equipment and wiring shall meet the requirements of the *New York City Electrical Code*, and shall be maintained in compliance with such requirements. Portions of permanent electrical installations may be used for temporary operations provided the requirements of the *New York City Electrical Code* are met.

**3303.2.3.1 Temporary lighting for construction sites.** Temporary lighting for construction sites shall use high-efficacy lamps with the following minimum efficacies:

1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts but less than or equal to 40 watts; and
3. 40 lumens per watt for lamps 15 watts or less.

**3303.2.4 Sanitary facilities.** Sanitary facilities shall be provided during construction or demolition activities in accordance with the *New York City Plumbing Code*.

**3303.2.5 Removing, relocating, or interrupting services.** If any utility is to be removed, relocated, or have its service interrupted, the utility company or city agency affected shall be notified at least 72 hours in advance. Prior to the removal of any service, the utility connection shall be disconnected and capped, and certifications to that effect issued by the representative utility company shall be filed with the department.

**3303.3 Watchperson.** Where an individual building being constructed or demolished has a footprint of between 5,000 square feet (1524 m<sup>2</sup>) and 40,000 square feet (12 192 m<sup>2</sup>), a competent watchperson shall be on duty at the site during all hours when operations are not in progress, from the time when the foundation is poured to when all work has concluded and the certificate of occupancy or temporary certificate of occupancy has been issued. Where the building has a footprint of more than 40,000 square feet (12 192 m<sup>2</sup>), at least one additional watchperson shall be on duty for each additional 40,000 square feet (12 192 m<sup>2</sup>) of building footprint, or fraction thereof. The watchperson shall be familiar with emergency notification procedures to the Fire Department, shall possess a valid security guard registration with the State of New York, shall hold a valid fire guard certificate from the Fire Department, and for a major building shall have completed the training required by Section 3310.10.



**Exceptions:**

1. Where the square footage of the building requires two or more watchpersons, the number of watchpersons may be reduced, subject to the approval of the commissioner, where:
  - 1.1. An alarm or video monitoring system is in place, or where the layout of the building allows a continuous line of sight across the entire building; and
  - 1.2. At least one watchperson is provided.
2. The building is being actively monitored in accordance with a fire safety and evacuation plan approved by the Fire Department in accordance with the *New York City Fire Code*.

**3303.4 Housekeeping.** Housekeeping at a site shall be in accordance with Sections 3303.4.1 through 3303.4.9.

**3303.4.1 Slipping and tripping hazards.** Slipping and tripping hazards in areas used by the public shall be minimized in accordance with Sections 3303.4.1.1 and 3303.4.1.2.

**3303.4.1.1 Maintenance.** All areas used by the public shall be maintained free from ice, snow, grease, debris, equipment, materials, projections, tools, or other items, substances, or conditions that may constitute a slipping, tripping, or other hazard.

**3303.4.1.2 Location of hose lines, wires, ropes, pipes, chains and conduits.** Hose lines, wires, ropes, pipes, chains, and conduits shall be located so that they will not constitute a tripping hazard to the public. Where it is necessary to carry such across sidewalks, or any public way, they shall either be suspended at least 8 feet (2438 mm) above ground or, if left on the ground, suitable chamfered planks or a pedestrian bridge shall be provided to cover such.

**3303.4.2 Containers.** Sufficient containers, including but not limited to waste dumpsters, debris boxes, and skip boxes, shall be available for the storage of all debris or waste. Such containers shall be made of metal, plastic, or other noncombustible material acceptable to the commissioner. Such containers shall also comply with the following:

1. Containers with wheels shall be secured at the end of the workday by rope, cable, or chocking at the wheels in order to prevent movement.
2. Containers shall not be placed at the edge of the building at any time, except when being moved from the floor or building.
3. Containers holding debris or waste shall be covered at the end of the workday and at any time when full to near the rim. Containers need not be covered when they are not in use or while stored in a fully enclosed space at the end of the workday.

**3303.4.3 Reserved.**

**3303.4.4 Control of debris.** Control of debris shall include the following measures:

1. All floors, roofs, and working decks shall be cleaned of debris at least daily, and a daily inspection made by a competent person to verify such has occurred. If the building is a major building, such inspection shall be noted in the site safety log.
2. Debris that cannot be removed from the site by the end of the shift shall be placed in containers meeting the requirements of this section or shall be secured overnight to protect the public and property and shall be removed from the site or placed in containers at the beginning of the next shift.

**Exception:** Combustible debris shall not be permitted to accumulate and shall be removed from the site in accordance with Section 3303.5.1.

**3303.4.5 Storage of materials and equipment during construction or demolition.** Material and equipment stored at a site during construction or demolition operations shall comply with Sections 3303.4.5.1 and 3303.4.5.2.

**3303.4.5.1 Open and exposed areas.** When not being used, material or equipment located on a working deck, unenclosed floor, roof, ground area, or similar exposed area shall be secured against dislodgement by wind or accidental impact.

**3303.4.5.2 Storage near unenclosed perimeters.** All material or equipment not being used shall be stored at least 10 feet (3048 mm), measured along all horizontal dimensions, from all unenclosed perimeters of the building or structure. Such material or equipment shall be secured in accordance with the requirements of Section 3303.4.5.1.

**Exceptions:** Provided the material or equipment is secured against accidental movement, in lieu of the 10 foot (3048 mm) set back distance:

1. Material or equipment that weighs 750 pounds (340.2 kg) or more may be stored at least 5 feet (1524 mm) from the unenclosed perimeter.
2. Where the floor area is less than 1,000 square feet (304.8 m<sup>2</sup>), material or equipment, regardless of weight, may be stored at least 5 feet (1524 mm) from the unenclosed perimeter.
3. Where located on a floor or working deck that is at or above the level of the horizontal safety netting in accordance with Section 3308, material or equipment may be stored at least 2 feet (610 mm) from the unenclosed perimeter.
4. Material related to concrete operations may overhang the unenclosed perimeter of the building or structure, provided:



- 4.1. The material is banded with a minimum of two equally spaced bands to prevent dislodgement;
- 4.2. The material is braced and secured in place by positive means as indicated on the site safety plan, or where there is no site safety plan, in accordance with drawings prepared by a registered design professional;
- 4.3. The material overhangs by no more than one-third of its length;
- 4.4. The material is stored in an area designated on the site safety plan, or where there is no site safety plan, in an area designated on drawings prepared by a registered design professional;
- 4.5. Such designated area is broom swept and cleared of all materials, equipment, and debris prior to the temporary removal of the vertical netting and placement of overhanging material in the designated area;
- 4.6. The perimeter of such designated area, except for the perimeter along the unenclosed perimeter, is protected by vertical netting meeting the requirements of Section 3308.5 or an alternative system acceptable to the commissioner;
- 4.7. Horizontal safety netting meeting the requirements of Section 3308.6 is provided at a level not more than two stories or 30 feet (9144 mm) below the overhanging material, with such nets in place for the full time the material is overhanging, except that the nets may be pulled in at the immediate time the material is being hoisted or lowered where such nets would conflict with the hoisting or lowering operation; and
- 4.8. The material is relocated on the next workday.

**3303.4.6 Storage of combustible material and equipment.** Storage of combustible material and other material and equipment that may present a fire hazard shall comply with the *New York City Fire Code*.

**3303.4.7 Storage near sidewalks, walkways, and pathways.** Material stored adjacent to a sidewalk, walkway, or pathway that remains open to the public shall not be piled higher than 3 feet (914 mm), or where a solid fence or barrier is provided, to within one foot (305 mm) of the top of such fence or barrier. For the purposes of this section, the term "adjacent to" shall be any area that is within a horizontal distance that is equal to or less than the vertical height of the piled material.

**Exception:** Material stored within a dumpster or similar solid container, provided such material is not piled above the top of such dumpster or container.

**3303.4.8 Machinery.** All exposed, electrically charged, moving or otherwise dangerous parts of machines and construction or demolition equipment shall be located, guarded, shielded, or barricaded so as to prevent contact by the public.

**3303.4.9 Internal combustion-powered equipment.** In addition to the requirements of this chapter, the use of internal combustion-powered equipment shall comply with the *New York City Fire Code*.

**3303.5 Removal of material and debris.** Material and debris shall be removed in a manner that prevents injury or damage to the public or property.

**3303.5.1 Removal of combustible debris.** Combustible debris shall not be permitted to accumulate, and shall be removed from the site at reasonable intervals in accordance with the requirements of the *New York City Fire Code*.

**3303.5.2 Dropping or throwing prohibited.** No material or equipment shall be intentionally dropped or thrown from a building or structure.

**3303.5.3 Clogging.** Precautions shall be taken to prevent concrete or mortar washings, sand, grit, or any other material that would cause clogging from entering a sewer or drain. Concrete washout water shall also meet the requirements of Section 3303.15.

**3303.5.4 Air pollution.** The provisions of the *Air Pollution Control Code* shall apply in order to prevent particulate matter from becoming airborne.

**3303.5.5 Chutes.** Chutes used in association with the removal of materials shall comply with Sections 3303.5.5.1 through 3303.5.5.5.

**3303.5.5.1 Enclosures.** Chute enclosures shall comply with the following requirements:

1. Material chutes that are at an angle of more than 45 degrees (0.79 rad) with the horizontal shall be entirely enclosed on all sides, except for openings at the floor levels for the receiving of materials. Such openings shall not exceed 48 inches (1219 mm) in height, measured along the wall of the chute, and all openings, except the top opening, shall be closed and secured when not in use.
2. Chutes at an angle of less than 45 degrees (0.79 rad) with the horizontal may be open on the upper side.

**3303.5.5.2 Chute construction.** Chute construction shall comply with the following requirements:

1. Every chute used to convey debris from a building or structure shall be rigidly supported and braced throughout its height. Chutes less than 24 inches (610 mm) in maximum dimension shall be constructed of not less than 1-inch (25.4 mm) (nominal) wood, or 1/8-inch thick (3.18 mm) steel, or a material of equivalent strength and durability acceptable to the commissioner. Chutes more than 24 inches (610 mm) in maximum dimensions shall be constructed of not less

than 2-inch (51 mm) (nominal) wood, or  $\frac{3}{16}$ -inch thick (4.76 mm) steel, or a material of equivalent strength and durability acceptable to the commissioner.

2. Chutes shall be provided with a metal impact plate where material is forced to change direction while falling.
3. A gate shall be provided at the lower end of every chute to control the loading of material into trucks and to close the chute at all other times. Splash-boards or baffles shall be erected to prevent materials from rebounding into the street or under the sidewalk shed.
4. A bumper or curb at least 4 inches by 4 inches (102 by 102 mm) in section shall be provided at each chute opening where such opening is level with, or below, the floor or platform. Every space between the chute and the edge of the opening in the floor or platform shall be solidly planked.

**3303.5.5.3 Fire-retardant construction.** When used in the following applications, all chutes constructed of combustible material shall be covered on the exterior with corrugated steel sheeting having a minimum thickness of 24 gauge through their entire height. Alternatively, chutes shall be constructed of noncombustible material:

1. Chutes exceeding 75 feet (22 860 mm) in height.
2. Alteration, repair or partial demolition of buildings where the main use or dominant occupancy is in Group I.

**3303.5.5.4 Supports.** All structural supports of material chutes shall be of noncombustible material.

**3303.5.5.5 Design and permit.** No chute shall be installed until a permit has been issued by the commissioner on the basis of drawings prepared by a registered design professional.

**Exception:** Design and permit is not required for a chute that is:

1. Installed on the exterior of a building or structure at a height of 40 feet (12 192 mm) or less in height above the level of the adjoining ground;
2. Has been designed by a manufacturer and is installed in accordance with the manufacturer's design; and
3. Does not attach to or impart a load on a scaffold.

**3303.6 Escape hatches.** Where portable fuel fired heaters or other heating equipment are used to provide temporary heating during the placing of concrete for a floor, an escape hatch shall be provided. The escape hatch shall extend from the floor where the concrete is being placed and through at least one story immediately below such floor. The escape hatch shall be located as near to the center of the building or structure as practical.

**Exception:** An escape hatch is not required provided at least one permanent stairway is available for use on the floor where such concrete placement is occurring and that such stairway is enclosed from the ceiling to the floor of the floor where such concrete placement is occurring and from the ceiling to the floor immediately below such floor with the permanent fire-rated enclosure for the stair or a fireproof tarp wrapped tightly around the stair shaft so that no smoke can penetrate.

**3303.6.1 Required ladders and metal shields.** The escape hatch shall be constructed with at least two fixed, vertical ladders enclosed in a metal shield. The ladders shall extend from a distance of 3 feet (914 mm) above the floor where concrete is being placed to either at least two stories below, or to the ground floor, whichever is less. The metal shield shall enclose the ladders on all sides from the top of the floor where the concrete is being placed to at least the top of the floor next below. The inside dimensions between faces of the shield shall be not less than 3 feet 8 inches (1 118 mm).

**Exception:** Extension ladders may be utilized where the horizontal dimension between the faces of the shields is equal to or greater than one-quarter the height of the shaft.

**3303.6.2 Shield space and decking.** The space between the shield and the perimeter of the opening in the floor under construction and also between the shield and the perimeter of the opening in the floor next below shall be decked over with 2-inch (51 mm) or heavier planking covered with plywood or sheet metal so as to make the decking smoke tight. At the termination of the ladders, the opening in the floor shall be covered completely with 2-inch (51 mm) planking or other material of equivalent strength.

**3303.7 Fire prevention and fire protection.** Firefighting equipment, fire fighting access at the construction or demolition site, and the conduct of all construction or demolition operations affecting fire prevention and fire fighting shall comply with the *New York City Fire Code* and the provisions of Sections 3303.7.1 through 3303.7.5.

**3303.7.1 Water supply.** A water supply for fire protection shall be provided in accordance with the *New York City Fire Code*.

**3303.7.1.1 Large footprint construction.** For a building that has a footprint of 100,000 square feet (30 480 m<sup>2</sup>) or more, regardless of the height of the building, and the building is substantially enclosed, permanent or temporary fire hydrants available for fire department use shall be provided during the course of construction:

1. Within 50 feet (15 240 mm) of the main entrance; and
2. Along the perimeter of the building, with the hydrants located so that there is at least one hydrant along every 250 feet (76 200 mm) of building perimeter, and with no hydrant more than 50 feet (15 240 mm) from the exterior wall.

**3303.7.2 Fire extinguishers.** Fire extinguishers shall be provided in accordance with the *New York City Fire Code*.

**3303.7.3 Smoking.** Smoking shall be prohibited at all construction and demolition sites. No smoking signs shall be posted at the site in accordance with the provisions of the *New York City Fire Code*.

**3303.7.4 Sprinkler systems.** Existing sprinkler systems in buildings undergoing an alteration or demolition shall comply with the requirements of Section 3303.7.4.1 through 3303.7.4.3.

**3303.7.4.1 Sprinklers during alteration.** Existing sprinkler systems in buildings undergoing an alteration shall be maintained in accordance with Section 3303.9, except as provided in Section 3303.7.4.3. The red paint required pursuant to Section 903.6 of this code shall be maintained during any alteration operation.

**3303.7.4.2 Sprinklers during demolition.** When existing sprinkler systems with fire department hose connections are present in buildings undergoing full or partial demolition, such systems shall be maintained as a nonautomatic sprinkler system, except as provided in Section 3303.7.4.3. When demolition starts, the sprinkler risers shall be capped immediately below the floor being demolished so as to maintain the sprinkler system on all lower floors for Fire Department use. Cutting and capping of sprinklers during demolition work shall be performed only by a licensed master plumber or licensed master fire suppression piping contractor who has obtained a permit for such work. Fire department hose connections shall be kept free from obstruction and shall be marked by a metal sign reading "Sprinkler Connection" and by a red light at night. The red paint required pursuant to Section 903.6 of this code shall be maintained during any demolition operations.

**3303.7.4.3 Removal of damaged sprinklers.** Requests for a variance from the sprinkler requirements of this section shall be limited to requests to remove a damaged or inoperable sprinkler system or a portion of such system in connection with demolitions or gut rehabilitations. Applications for construction document approvals for such requests shall be filed with the department by a registered design professional in accordance with the following procedure:

1. The filed application shall include a complete report prepared by the professional describing the extent of the damage and attesting as to why the system cannot be restored; and
2. The variance shall not be approved by the department without the concurrence of the Fire Department as follows:
  - 2.1. The applicant shall file the request for variance with the Fire Department;
  - 2.2. The Fire Department shall review and recommend any necessary safety measures

required as a condition of granting the variance; and

- 2.3. The applicant shall submit the Fire Department's recommendation to the department along with proof of satisfactory implementation of such safety measures.

**3303.7.5 Standpipe systems.** Standpipe systems shall meet the requirements of Section 3303.8.

**3303.8 Standpipe systems during construction, alteration or demolition.** During construction, alteration or demolition operations, standpipe systems shall comply with the following:

1. When, during the course of the construction of a new building the working deck reaches a height of 75 feet (22 860 mm) or greater above the ground in a building for which a standpipe system will be required, a permanent or temporary standpipe system meeting the requirements of Section 905 shall be kept in a state of readiness at all times for use by fire-fighting personnel. The standpipe system shall serve all floors where the permanent stairs are required per Section 3303.11. No standpipe shall be considered to be in a state of readiness unless it is painted red in accordance with the provisions of Section 905.11 of this code. When freezing conditions may be encountered, the system in whole, or the part of the system subject to freezing conditions, shall be maintained as a dry system.
2. Existing standpipe systems in structures undergoing a full demolition shall be maintained as dry standpipes. At the commencement of demolition, the standpipe risers shall be capped above the outlet on the floor immediately below the floor being demolished so as to maintain the standpipe system on all lower floors for Fire Department use. Cutting and capping of standpipes during demolition work shall be performed only by a licensed master plumber or licensed master fire suppression piping contractor who has obtained a permit for such work. Standpipe hose, nozzles and spanners are not required to be maintained and may be removed at any time. The red paint required pursuant to Section 905.11 of this code shall be maintained during any demolition operations. All existing house check valves shall remain in place until completion of the demolition work.
3. When, during the course of the construction of a new building which will have a occupiable space at a depth of 75 feet (22 860 mm) or greater below the level of the ground in a building for which a standpipe system will be required, a permanent or temporary standpipe system meeting the requirements of Section 905 shall be installed and shall be kept in a state of readiness at all times for use by fire-fighting personnel. The standpipe system shall serve all stories below grade and shall be installed as soon as a temporary or permanent stair is installed below grade. No standpipe shall be considered to be in a state of readiness unless it is painted red in accordance with the provisions of Section 905.11 of this code. When freezing conditions may be encountered



tered, the system in whole, or the part of the system subject to freezing conditions, shall be maintained as a dry system.

4. When, during the course of alteration or partial demolition operations in a building for which a standpipe system is required, the standpipe system shall be maintained in accordance with Section 3303.9. In an unoccupied building, an existing wet standpipe system may be maintained as a dry system subject to the approval of the commissioner and the commissioner of the fire department, and also provided the standpipe system is equipped with an air pressurized alarm system meeting the requirements of Section 3303.8.1. No standpipe shall be considered to be in a state of readiness unless it is painted red in accordance with the provisions of Section 905.11 of this code.

- 4.1. If the alteration work results in the addition of new stories to the structure at a height of 75 feet (22 860 mm) or greater above the level of the ground, the requirements of Item 1 of this section shall apply to such new stories during the course of the alteration operation.

- 4.2. If the alteration work results in the addition of new occupiable space at a depth of 75 feet (22 860 mm) or greater below the level of the ground, the requirements of Item 3 of this section shall apply to such new occupiable space below grade during the course of the alteration operation.

**3303.8.1 Air pressurized alarm system for dry standpipe systems during construction or demolition operations.** Dry standpipe systems utilized during construction or demolition operations shall be provided with an air pressurized alarm system as set forth in Items 1 through 5 below. The provisions of NFPA 14, Chapter 12, as modified in Appendix Q, shall also apply.

1. Full demolitions. In buildings and structures undergoing a full demolition, all existing standpipes shall be maintained in a state of readiness as a dry system in accordance with Item 2 of Section 3303.8 and shall be provided with an air pressurized alarm system.
2. New construction, alteration, and partial demolition. Where a dry standpipe system is utilized during new construction, alteration, or partial demolition operations, such standpipe system shall be provided with an air pressurized alarm system.
3. Submission of application. An application to install an air pressurized alarm system shall be filed by a registered design professional and a permit obtained by a licensed master plumber or licensed master fire suppression piping contractor. A licensed electrician shall obtain all required electrical permits in accordance with Chapter 3 of Title 27 of the *Administrative Code*.
4. Specifications. The following provisions shall apply to the air pressurized alarm system:

- 4.1. Pressure. Pressure shall be maintained in the standpipe and cross connections at all times and shall not exceed 25 psig (172 kPag) by utilizing nitrogen or an air compressor with an air dryer. The supervisory pressure shall be as determined by a registered design professional.

- 4.2. Automatic air pressurized alarm activation. The alarm shall be automatically activated when the pressure drops below the supervisory pressure or rises above the maximum pressure of 25 psig (172 kPag). When the alarm is activated, notification shall be made to the Fire Department in accordance with the *New York City Fire Code*, all work at the site shall cease, except as provided in Item 4.2.1, and an investigation of the entire standpipe system and air compressor shall be immediately performed to determine the cause of the alarm. Unless authorized by the Fire Department, no construction or demolition work shall resume until the standpipe system is repaired and the appropriate pressure is restored, except that any repairs to the standpipe system needed to restore the required pressure shall be undertaken immediately and the standpipe system restored as soon as possible. There shall be compliance with the requirements of the *New York City Fire Code* while the standpipe system is out of service. Upon completion of repairs to the standpipe system a full inspection of such system shall be performed, which shall include, among other things, visually tracing the standpipe, including risers, cross connections and fire department connections to verify that no breach exists and checking all gauges of the standpipe system to ensure the standpipe system has been restored to a state of readiness.

- 4.2.1. Notwithstanding the provisions of Item 4.2, the activation of the alarm shall not require the cessation of work necessary for the completion of concrete pouring operations in progress at the time of alarm activation, where such cessation would cause a cold joint that would impair the structural integrity of the finished construction. The continuation of such operations shall be permitted only until an orderly termination of such operations can be effectuated. The site safety manager or coordinator shall record the names and locations of any employees necessary for the completion of the concrete pouring operations and provide them to the Fire Department personnel who arrive on the scene.

- 4.3. Air compressor. The air compressor shall be designed to automatically cut in and cut out at the supervisory pressure and shall be tied into the standpipe system between the fire depart-



- ment connections and the house check valves. The air compressor shall utilize an air dryer during times when freezing conditions exist to condition the air entering the dry standpipe system.
- 4.4. Alarm. The standpipe alarm system shall utilize pressure switches and control equipment to annunciate a local audible alarm on site that can be heard during working and non-working hours. The audible signal of the horn shall be at least 15 dBA above the ambient noise level but no more than 110 dBA.
  - 4.5. Power supply. The standpipe alarm system shall be connected to an active, dedicated power supply at all times.
  - 4.6. Check valves. Check valves shall be installed to prevent water from entering the air compressor.
  - 4.7. Locks and caps. All control valves shall be chained and locked in the appropriate position and shall be provided with capped outlets. All hose valves shall also be provided with capped outlets.
  - 4.8. Fire Department connections. Three inch (76 mm) iron hose plugs with gaskets in Fire Department connection swivels shall be provided.
  - 4.9. Drainage. Provisions shall be made to drain water in any trapped sections of the dry standpipe system that are subject to freezing.
  - 4.10. Manual air release connection. A minimum 2.5-inch (64 mm) connection located immediately downstream of the fire department connection check valve shall be provided and piped to a location immediately adjacent to the fire department connections. This line shall be fitted with a 2.5-inch (64 mm) hose valve and shall allow for release of the pressurized air from the dry standpipe system. The number of air release valves provided shall be such that the air pressure shall be released in no more than 3 minutes, which shall be verifiable by an actual air release test performed at the time of the initial installation.
  - 4.11. Construction documents. Plans shall identify all standpipe risers, cross connections, fire department connections, any intermediate check valves that have to be removed, proposed location of the air release connections, designation of the supervisory pressure, complete information regarding the alarm system, and procedures for the safe pressurization and depressurization of the system.
  - 4.12. Signage. Signage shall be provided at all fire department connections indicating that the dry standpipe system is pressurized and showing the location of the manual air release.
  - 4.13. Pressure gauges. A system of pressure gauges shall be installed at the compressor and at the most remote points of the system from the compressor.
  5. Planned removal from service of standpipe system and standpipe air pressurized alarm. Whenever the standpipe system is to be placed out of service for the addition of a new section to the system, removal of an existing section as demolition operations progress, or other planned event, the standpipe alarm may be temporarily deactivated subject to compliance with the requirements of the *New York City Fire Code*. Where a site safety manager or coordinator is required by this code, all alarm activations, inspections, and repairs shall be logged into the log book maintained by such site safety manager or coordinator. If the standpipe system is not returned to a state of readiness and the alarm reactivated within 2 hours of such planned removal from service, all construction or demolition work at the site shall cease, unless otherwise approved by the Fire Department.
- 3303.8.2 Free from obstruction.** Fire department hose connections shall be kept free from obstruction and shall be marked by a metal sign reading, "Standpipe Connection" and by a red light at night.
- 3303.8.3 Use of standpipes for purposes other than supplying water for firefighting.** Standpipes may be used for a purpose other than to supply water for firefighting operations, including but not limited to supplying water or compressed air for construction or demolition operations, subject to the approval of the Fire Department and provided at least one standpipe riser is maintained at all times for firefighting operations. Where the standpipe is used to supply water for construction or demolition operations and freezing conditions may occur, the standpipe shall be completely drained after use to prevent freezing.
- 3303.9 Elements to be maintained in existing buildings.** Required means of egress, existing structural elements, fire protection devices, and sanitary safeguards shall be maintained at all times during construction or demolition operations in existing buildings. Required means of egress shall not be obstructed in any manner that would destroy the full effectiveness of such means of egress.
- Exception:** Where adequate alternate provisions are provided in accordance with the requirements of this code, or where the element is temporarily or permanently disconnected, removed, or demolished in accordance with the requirements of this code and of the agency or authority having jurisdiction to temporarily or permanently disconnect, remove, or demolish such element. Such alternative means, disconnection, removal, or demolition shall be shown on the approved plans. Fire protection systems, including but not limited to sprinklers, standpipes, and fire alarms, shall only be taken out of service in accordance with the requirements of the *New York City Fire Code*.

**3303.10 Operations in occupied buildings.** When construction or demolition activity occurs in an occupied building, barricades, signs, drop cloths, and other protective means shall be installed and maintained as necessary to provide reasonable protection for the occupants against hazard and nuisance. Such protective means shall be indicated on an occupant protection plan, or where a tenant protection plan is required by Section 3303.10.1, on a tenant protection plan.

**3303.10.1 Tenant protection plan.** In buildings containing occupied dwelling units, including newly constructed buildings that are partially occupied where work is still ongoing within the building, all construction or demolition work shall be performed in accordance with a tenant protection plan as required by Chapter 1 of Title 28 of the *Administrative Code*.

**3303.11 Stairs during construction or demolition.** During construction and demolition stairs shall comply with the following:

1. During the course of construction of a new building, or in spaces being added to an existing building, at least one permanent stair shall be brought to within a distance of 40 feet (12 192 mm) or 4 floors below the working deck at all times. In all other locations where permanent stairs will be required, a temporary or permanent stair shall be brought to within a distance of 40 feet (12 192 mm) or 4 floors below the working deck at all times.
2. Stairs in an existing building undergoing alteration or a partial demolition shall be maintained in accordance with Section 3303.9. Stairs in a building undergoing a full demolition shall comply with Section 3306.9.9.
3. All stairs in a building undergoing construction or demolition shall be lighted at all times and kept free of equipment, debris, and material.

**3303.12 Elevators and hoists during construction or demolition.** Elevators and hoists during construction or demolition work shall meet the requirements of Sections 3303.12.1 through 3303.12.5.

**3303.12.1 Publically accessible floors.** Existing elevators serving publically accessible floors in a building undergoing construction or demolition work shall be maintained in accordance with Section 3303.9.

**3303.12.2 Floors closed to the public.** All floors closed to the public in a new or existing building undergoing construction or demolition work shall be served by, at least, either:

1. An elevator meeting the requirements of Chapter 30, which shall be kept in readiness at all times for Fire Department use; or
2. A hoist meeting the requirements of Section 3318, which shall be available at all times for fire department use.

**Exceptions:** An elevator or hoist is not required during the course of construction or demolition for:

1. A building that does not require a permanent elevator.

2. Floors that are located within a vertical distance of seven stories or 75 feet (22 860 mm) or less from the working deck.

**3303.12.3 Deep excavations.** Where the proposed lowest level of a building with a footprint of 10,000 square feet (3048 m) or greater is constructed at a depth greater than 75 feet (22 860 mm), a hoist meeting the requirements of Section 3318 shall be available at all times for Fire Department use once such floor has been poured and set. The hoist shall serve the level at grade and all stories below grade.

**Exception:** Subject to the approval of the commissioner, alternate means available at all times for Fire Department use, including but not limited to a vehicular ramp, shall be provided.

**3303.12.4 Converting elevators.** Where an existing elevator is converted from passenger or freight use the department shall be notified in accordance with the requirements of Chapter 30.

**3303.12.5 Hoist travel.** If the travel of the hoist cannot be increased or decreased to fulfill the requirements of this section due to inclement weather, it shall be increased by the end of the next working day.

**3303.13 Interrupted or abandoned and discontinued operations.** Sites where construction or demolition work has been interrupted or abandoned and discontinued shall be protected in accordance with the requirements of Sections 3303.13.1 through 3303.13.3.

**3303.13.1 Fencing.** A fence meeting the requirements of Section 3307 shall be maintained throughout the duration of time that operations at the site are interrupted or abandoned and discontinued.

**3303.13.2 Safety monitoring plan.** Where work has been interrupted or abandoned and discontinued for a period of at least three months, a safety monitoring plan shall be prepared and submitted to the department. Such safety monitoring plan shall be specific to the site, shall identify safeguards to be instituted and maintained to secure the site, and shall specify monitoring to be performed during the duration of suspension of work. The site shall be monitored in accordance with such plan.

**3303.13.3 Filling and grading.** Where work has been interrupted or abandoned and discontinued for a period of at least three months, all open excavations shall be filled and graded to eliminate all steep slopes, holes, obstructions or similar sources of hazard. Fill shall consist of clean, noncombustible material. The final surface shall be graded in such a manner as to drain the lot, eliminate pockets in the fill, and prevent the accumulation of water without damaging any foundations on the premises or on adjoining property.

**Exception:** Filling and grading is not required for abandoned, discontinued, or interrupted excavations that are:

1. Secured in accordance with Section 3303.13.2, and

2. Inspected periodically by an engineer to verify continued stability of the excavation, with a record of such inspections signed, sealed, and dated by the engineer.

**3303.14 Drainage.** No condition shall be created as a result of construction or demolition operations that will interfere with natural surface drainage. Water courses, drainage ditches, etc., shall not be obstructed by refuse, waste building materials, earth, stones, tree stumps, branches, or other debris that may interfere with surface drainage or cause the impoundment of surface waters.

**3303.14.1 Protection of foundations.** Provision shall be made to prevent the accumulation of water or water damage to any foundations on the premises or to adjoining property.

**3303.14.2 Drainage of excavations.** All excavations shall be drained, and the drainage shall be maintained as long as the excavation continues or remains. Where necessary, pumping shall be used, provided proper permits are obtained from the New York City Department of Environmental Protection.

**3303.14.3 Clogging.** The requirements of Section 3303.5.3 shall apply.

**3303.15 Concrete washout water.** Concrete washout water shall not be allowed to enter any sewer, catch basin, drain, or body of water or to leach into the ground.

**3303.15.1 Collection and containment.** All concrete washout water shall be collected and contained in or on the concrete mixer truck or in pre-manufactured watertight containers specifically designed and fabricated for the purpose of collecting and containing concrete washout water on-site. Such containers shall be of sufficient quantity and size to accommodate all rinsing operations required on-site so as not to delay the timely return of concrete ready mix trucks to the concrete plant and shall be protected from breach or overflow at all times.

**3303.15.2 Location.** Rinsing operations and concrete washout water containers shall not be located less than 30 feet from any sewer, drain, catch basin, or body of water without the written approval of the commissioner.

**3303.15.3 Disposal.** Collected concrete washout water shall be transported off site for treatment and disposal or contained on site until completely evaporated. Any hardened concrete remaining after evaporation shall be disposed of, reused or recycled.

**3303.16 Contractors sheds and offices.** Contractors sheds and offices located within 30 feet (9144 mm) of new construction, existing buildings, or another contractor shed or office shall be made of metal or other noncombustible material.

**Exception:** Contractor sheds and offices located within a building and protected from weather may use fire-retardant treated wood, provided the shed does not exceed one story in height and 120 square feet (36.58 m<sup>2</sup>) in area and is at least 30 feet (9144 mm) from another shed.

## SECTION BC 3304 SOIL AND FOUNDATION WORK

**3304.1 Scope.** The provisions of this section shall apply to all soil and foundation work, including but not limited to excavations made for the purposes of taking earth, sand, gravel, or other material, as well as to soil and foundation work related to accessory uses such as garages, pools, and decks, and also to the underpinning or bracing of buildings or structures, in order to safeguard the public and property from such work.

### Exceptions:

1. Soil or foundation work not related to the underpinning or bracing of an existing building or structure, and which is performed in connection with utility or infrastructure work occurring within a public right of way, including but not limited to the construction, alteration, maintenance, repair, or demolition of bridges, streets, sidewalks, highways, railroads, subways, water tunnels, or utility lines.
2. Soil or foundation work on cemetery grounds for burials.
3. Soil or foundation work performed within an industrial or commercial quarry, plant, or yard and not related to the construction or demolition of a building or structure on the property of such quarry, plant, or yard.

**3304.1.1 Measurements.** The depth of all soil and foundation work shall be measured from the level of the adjacent ground surface to the lowest point of the soil and foundation work. The height of all soil and foundation work shall be measured from the level of the adjacent ground surface to the highest point of the soil and foundation work. Where soil and foundation work occurs within a basement or cellar, the soil and foundation work shall be measured from the level of the adjacent slab.

**3304.2 Support of excavation drawings.** The sides of all excavations, including related or resulting embankments, shall be supported as specified on drawings. Such drawings shall be site specific and shall clearly illustrate all related protection and support of the excavation, including but not limited to sloping, stepping, sheeting, shoring, bracing, guardrail systems, and fences as required by Section 3304.4, with all dimensions indicated. Such drawings shall also indicate any utilities or public infrastructure impacted by the excavation. The drawings shall be prepared by a registered design professional who has demonstrated knowledge or experience in the design of retaining structures or bracing systems for the support of excavation.

### Exceptions:

1. Drawings for the support of excavation are not required for an excavation:
  - 1.1. That occurs 5 feet (1524 mm) or less in depth, provided:
    - 1.1.1. The excavation also occurs more than 5 feet (1524 mm) from all footings and foundations; or



1.1.2. Where the excavation occurs within five feet (1524 mm) or less from a footing or foundation, such excavation does not occur below the level of the footing or foundation.

1.2. Where the sides of the excavation are sloped not steeper than 45 degrees (0.79 rad) or stepped so that the average slope is not steeper than 45 degrees (0.79 rad) with no step more than 5 feet (1524 mm) high, provided such slope or step begins at least five feet (1524 mm) from all footings and foundations.

1.3. Where a trench box is utilized in accordance with the manufacturer's specifications, provided the manufacturer specifications are available onsite.

2. Support of excavation drawings can be prepared by a qualified person for an excavation occurring in conjunction with the construction or demolition of an exterior in-ground pool, provided such pool is an accessory to a one- two- or three-family home, is limited to 400 square feet (121.92 square meters) in area, and provided that the distance from the edge of the pool to any building, structure, or lot line is greater than the depth of the deepest portion of the pool.

3. Where demolition drawings are required by Section 3306.5, separate support of excavation drawings for the removal of the foundation are not required, provided such detail is shown on the demolition drawings.

**3304.3 Notification.** Prior to the commencement of soil or foundation work, notification shall be provided as follows.

**3304.3.1 Notification of the department.** No soil or foundation work within the property line shall commence unless the permit holder, or where there is no permit holder the person causing the soil or foundation work to be made, notifies the department, via phone or electronically, at least 24 hours, but no more than 48 hours prior to the commencement of such work. The notification shall state the date that such soil or foundation work is to commence. Should the notification date fall on a weekend or official holiday, the permit holder shall notify the department on the last business day before the commencement date.

In the event that the soil or foundation work does not begin on the date provided in the notification to the department, the permit holder, or where there is no permit holder the person causing the soil or foundation work to be made, shall notify the department of its cancellation not more than 24 hours prior to but no later than the date for which the soil or foundation work was scheduled. Should the cancellation date fall on a weekend or an official holiday, the permit holder, or where there is no permit holder the person causing the soil or foundation work to be made, shall notify the department on the next business day after the intended commencement date. The permit holder, or where there is no permit holder the person causing the soil

or foundation work to be made, shall notify the department of a new intended commencement date pursuant to the provisions above.

The commissioner may issue a stop work order if there is a failure to provide notice as required in this section and if the work is found to violate any of the provisions of this code, the *New York City Zoning Resolution*, or other applicable laws or rules. Upon the issuance of such stop work order, the work shall be stopped for a minimum of three business days to enable the department to take any other appropriate action to ensure that the earthwork is being performed in a safe manner. The earthwork shall not recommence until the stop work order has been lifted.

**Exceptions:** Notification to the department is not required for the following:

1. Hand excavation work that extends 5 feet (1524 mm) or less in depth and is 2 feet (610 mm) or more from an existing footing or foundation. This exception shall not apply to any hand excavation work performed anywhere in existing or demolished basements or cellars that adjoin existing foundations.

2. Excavations for a geotechnical investigation that do not exceed 10 feet (3048 mm) in length, width, or diameter, and that are conducted under the supervision of a registered design professional.

3. Emergency work performed by the Department of Housing Preservation and Development (HPD) or other agency as directed by the commissioner or work on unsafe buildings performed by HPD or other agency pursuant to a precept.

4. Soil or foundation work related to gardening or landscaping work, provided no excavation occurs to a depth greater than 5 feet (1524 mm); and either:

4.1. The excavation occurs more than 5 feet (1524 mm) from all footings and foundations; or

4.2. Where the excavation occurs within 5 feet (1524 mm) or less from a footing or foundation, such excavation does not occur below the level of the footing or foundation.

5. Soil or foundation work related to the pouring of a slab or pavement, provided no excavation to a depth greater than 2 feet (610 mm) occurs in conjunction with such work.

6. Where notification is required by Section 3306.3, separate notification for the removal of a foundation is not required.

**3304.3.2 Notification of adjoining property owners.** When an excavation to a depth of 5 feet to 10 feet (1524 mm to 3048 mm) is to be made within 10 feet (3048 mm) of an adjacent footing or foundation, or when any excavation over 10 feet (3048 mm) is to be made anywhere on a site, the person causing the excavation to be made shall



provide written notice to the owners of the adjoining property not less than 10 days prior to the scheduled starting date of the excavation. The written notice shall provide a description of the work to be performed, the timeframe and schedule, and the contact information of the person causing the excavation and of the department.

**Exception:** Notification is not required where the excavation is set back from the edge of the adjacent footing or foundation or adjoining property by a ratio of 2 horizontal to 1 vertical, as measured from the deepest point of the excavation.

**3304.3.3 Notification to the Department of Environmental Protection.** Whenever excavation or drilling, for any purpose, to a depth greater than 100 feet (30 480mm) is proposed in a block that has any part of its boundary falling within 500 feet (152 m) horizontal distance from the centerline of any water tunnel as measured at or near the surface (the “Corridor”), an approval and permit shall be obtained from the New York City Department of Environmental Protection. The owner of the premises or the contractor shall notify the New York City Department of Environmental Protection prior to commencement of any such activity. The issuance of any permit or approval by the department shall not relieve the applicant of the obligation to comply with any approval or permitting requirements of the New York City Department of Environmental Protection.

**3304.3.4 Excavations requiring permit from the New York State Department of Environmental Conservation.** Whenever drilling or excavation is planned deeper than 500 feet (152 m) below grade, a permit may be required from the New York State Department of Environmental Conservation. The issuance of any permit or approval by the department shall not relieve the applicant of the obligation to comply with any approval or permitting requirements of the New York State Department of Environmental Conservation. Whenever any drilling for borings or geothermal wells is planned, the owner of the premises or the contractor shall notify the New York State Department of Environmental Conservation prior to commencement of such activity to determine if a permit is necessary.

**3304.3.5 Notification and permit requirements of the New York City Transit Authority, the Metropolitan Transportation Authority, and the Port Authority of New York and New Jersey.** Whenever an excavation of any depth is proposed within 200 feet (60 960 mm) of any subway or tunnel under the jurisdiction of the New York City Transit Authority, the Metropolitan Transportation Authority, or the Port Authority of New York and New Jersey, an approval and permit shall be obtained from such authority having jurisdiction. The owner of the premises or the contractor shall notify the authority having jurisdiction prior to commencement of any such activity. The issuance of any permit or approval by the department shall not relieve the applicant of the obligation to comply with any approval or permitting requirements of the New York

City Transit Authority, the Metropolitan Transportation Authority, or the Port Authority of New York and New Jersey.

**3304.3.6 Notification and permit requirements of the New York City Fire Department.** Soil or foundation work that is to be done with the use of explosives shall also be subject to the notification and permit requirements set forth in the *New York City Fire Code*.

**3304.4 Protection of sides of excavations.** The sides of excavations shall be protected in accordance with the requirements of Sections 3304.4.1 through 3304.4.6.

**3304.4.1 Support of excavation.** The sides of all excavations, including related or resulting embankments, that are 5 feet (1524 mm) or greater in depth or height shall be supported in accordance with one or more of the following means. Where required by Section 3304.2, such means shall be indicated on drawings:

1. Sheet piling, shoring, bracing, or by other retaining structures as may be necessary to prevent the sides of the excavation from caving in before permanent supports are provided. Such methods of protection shall be subject to special inspection in accordance with the provisions of Chapter 17; or
2. Excavation sides sloped not steeper than 45 degrees (0.79 rad) or stepped so that the average slope is not steeper than 45 degrees (0.79 rad) with no step more than 5 feet (1524 mm) high, provided such slope or step does not endanger any structure or temporary construction, including subsurface structures. Slopes or steps steeper than 45 degrees (0.79 rad), or steps more than 5 feet (1524 mm) high shall be permitted only where the registered design professional preparing the drawings required by Section 3304.2 determines, based upon the completion of a geotechnical investigation report acceptable to the commissioner, that the slopes or steps will be stable.

**Exception:** For a rock cut excavation, no protection is required, provided a registered design professional determines the rock cut will not be subject to shearing and will not otherwise be unstable before permanent supports are provided. Otherwise, the rock cut shall be stabilized in accordance with drawings prepared by the registered design professional.

**3304.4.2 Rainstorms.** See Section 3304.5.1.

**3304.4.3 Fence.** Every site with an excavation shall be enclosed with a fence that meets the requirements of Section 3307.7.

**3304.4.4 Guardrail system.** All open edges of an excavation that are 6 feet (1829 mm) or greater in depth shall be protected by a guardrail system meeting the requirements of Sections 3308.7.1 through 3308.7.5, or by a solid enclosure at least 3 feet 6 inches (1067 mm) high. For the purpose of a guardrail system installed in accordance with this section to protect the open edge of an excavation, the term

“floor” in Sections 3308.7.1 through 3308.7.5 shall mean “ground.”

#### Exceptions:

1. The toeboard, when installed in conjunction with such excavation guardrail system, shall consist, at a minimum, of a 1-inch by 6-inch $\frac{1}{4}$  (25 mm by 152 mm) lumber or metal plank and shall be at least 5 $\frac{1}{2}$  inches (140 mm) high.
2. A toeboard is not required where the sheeting, shoring, bracing, or any other support of excavation extends at least 5 $\frac{1}{2}$  inches (140 mm) above the top of the excavation.
3. A guardrail system or a solid enclosure is not required where access to the adjoining area is precluded.
4. A guardrail system or a solid enclosure is not required where side slopes are three horizontal by one vertical (33-percent slope) or flatter.

**3304.4.4.1 Openings.** To provide necessary openings for intermittent operations, one or more sections of the guardrail system or solid enclosure may be hinged or supported in sockets. When supported in sockets, rails shall be so constructed that they cannot be jolted out. A button or hook may be used to hold the guardrail system or solid enclosure in a fixed position. Substantial chains or ropes may be used to guard such openings in such guardrail system or solid enclosure. Where so used, the chains or ropes shall be taut at the same height as the rails of the standard guardrail system.

**3304.4.5 Placing of soil or foundation work equipment and excavated material.** Excavated material and superimposed loads, including but not limited to equipment and trucks used for soil or foundation work, shall not be placed closer to the edge of the excavation than a distance equal to one and one-half times the depth of such excavation unless the sides of the excavation have been sloped or sheet piled (or sheeted) and shored to withstand the lateral force imposed by such superimposed loads, or a registered design professional has determined the side of the excavation can adequately support the load imposed, with such support or determination shown on drawings required by Section 3304.2. In the case of open excavations with side slopes, the edge of excavation shall be taken as the toe of the slope.

**3304.4.6 Installation of protection.** Required protection for the sides of the excavation shall be installed as the excavation advances. The placement of permanent structures or fill in areas requiring support of excavation shall not begin until the support of excavation has been completed for such areas.

**3304.5 Inspections.** Soil and foundation work shall be inspected in accordance with the requirements of Sections 3304.5.1 through 3304.5.3.

**3304.5.1 Rainstorms.** All sides or slopes of excavations or

embankments shall be inspected after rainstorms, or any other hazard-increasing event, and safe conditions shall be restored.

**3304.5.2 Support of excavation.** Methods employed to protect the sides of excavations meeting the requirements of Item 1 of Section 3304.4.1 shall be subject to special inspections in accordance with Chapter 17.

**3304.5.3 Slurry.** The requirements of Section 3304.12 shall apply.

**3304.6 Retaining walls.** The requirements of Section 305 of Title 28 of the *Administrative Code*, as well as Sections 1806 and 3309 of the building code shall apply as applicable.

**3304.7 Access.** Every excavation shall be provided with at least one safe means of ingress and egress that is kept available at all times.

**3304.8 Drainage.** The requirements of Section 3303.14 shall apply.

**3304.9 Utilities.** The requirements of Section 3303.2 shall apply.

**3304.10 Dewatering.** The person causing the soil or foundation work to be performed shall dewater the site, as needed, for the progress of the work. Measures shall be taken to prevent settlement, slope failure, and damage to adjacent buildings, structures, and property affected by dewatering operations.

**3304.11 Underpinning requirements.** The requirements of Section 1814 and Section 3309 shall apply.

**3304.12 Slurry.** Where slurry is utilized to support an excavation, trench, or drill or bore hold, slurry mix proportions and installation procedures shall be provided by a registered design professional on signed and sealed design and installation procedures. The installation procedures shall account for all imposed loads, including those from the earth, adjacent structures, and adjacent equipment. The use of slurry to support excavations shall be subject to special inspection in accordance with Section 1704.20. Where such construction methods are used to install foundation elements, the new foundation elements installed as part of such operations shall be subject to special inspection as a permanent installation in accordance with the applicable sections of this chapter, including but not limited to special inspection for concrete, and welding.

## SECTION BC 3305 MATERIAL PLACEMENT AND INSTALLATION

**3305.1 Scope.** The placement and installation of structural steel, concrete formwork, aluminum, and masonry shall be in accordance with the requirements of this section.

**3305.2 Structural steel assembly.** Structural steel assembly shall be in accordance with the requirements of AISC 360 and the requirements of Sections 3305.2.1 through 3305.2.8.

**3305.2.1 Shop drawings.** Shop drawings shall include the location of oversized, short slotted, and long slotted holes.

**3305.2.2 Field connections.** The requirements of Section 2205.6.2 shall apply.

**3305.2.3 Handling and storing materials.** Structural steel members shall not be dropped, thrown, or dragged. All structural steel members shall be shipped and handled in a manner to avoid injury to protective coatings or permanent deformations of the members. Materials shall be protected against damage and corrosion that results in a loss of section. Any injury to protective coatings shall be repaired prior to the application of fireproofing, the placement of concrete around the steel, or any other action that would otherwise conceal the steel. Any loss of section, bends, crimps or other evidence of permanent deformations shall be straightened by methods approved by the registered design professional of record or the piece shall be rejected.

**3305.2.4 Placing of structural members.** During the placing of a structural member, the load shall not be released from the hoisting rope until the member is securely supported.

**3305.2.4.1 Open web steel joists.** Open web steel joists that are hoisted singly shall be transferred from their place of storage directly to their permanent location and safely secured. No load shall be placed on open web steel joists until they are permanently fastened in place or otherwise secured in accordance with methods approved by the registered design professional of record.

**3305.2.5 Tag lines.** While structural members or assemblies are being hoisted, a tag line or tag lines shall be used, as needed, to prevent uncontrolled movement.

**3305.2.6 Erection of trusses.** Trusses shall be braced or guyed, as necessary, for the safety of the structure.

**3305.2.7 Erection of frames.** Structural frames shall be properly braced with shores, guyed cables, turnbuckles, or other devices, as necessary, for the safety of the structure.

**3305.2.8 Permanent flooring and steel erection in tiered buildings.** The permanent floors of such buildings or other structures shall be installed as soon as possible as the erection of structural steel members progresses. In no case shall there be more than eight stories, floors or equivalent levels or 120 feet (36 576 mm), whichever is less, between the working deck and the uppermost permanent floor.

**Exception:** Where otherwise designed, in accordance with the approved construction documents, by the registered design professional of record.

**3305.3 Concrete formwork.** Concrete formwork shall be in accordance with the requirements of Sections 3305.3.1 through 3305.3.7.

**3305.3.1 General requirements.** The design, fabrication and erection of forms shall comply with the requirements of Sections 3305.3.1.1 through 3305.3.1.6.

**3305.3.1.1 Safe support of loads.** Formwork, including all related braces, shoring, framing, and auxiliary construction, shall be proportioned, erected, supported,

braced, and maintained so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the permanent construction.

**3305.3.1.2 Vertical and lateral loads.** Vertical and lateral loads shall be carried to the ground by the formwork system, by the new construction after it has attained adequate strength for that purpose, or by existing structures. Forms and their supports shall be designed so as not to damage previously placed structures.

**3305.3.1.2.1 Use of existing structures to support vertical or lateral loads.** The use of existing structures to support vertical or lateral loads imposed by concrete construction operations shall require an evaluation of the existing structure for the loads imposed by a registered design professional. The registered design professional shall prepare design drawings documenting the findings of the evaluation, indicate the location of formwork elements, and the interface between the formwork and the existing structure.

**3305.3.1.3 Bracing.** Forms shall be properly braced or tied together so as to maintain position and shape, and shall conform to the sizes and shapes of members as shown on the design drawings.

**3305.3.1.4 Ramps, runways and platforms.** Ramps, runways, and platforms utilized in connection with concrete placement shall comply with Section 3315.

**3305.3.1.5 Design.** Concrete formwork shall be designed in accordance with Section 3305.3.2.

**3305.3.1.6 Forms for prestressed and post-tensioned concrete.** Forms for prestressed and post-tensioned concrete members shall be designed and constructed to permit movement of the member without damage during application of the prestressing or post-tensioned force.

**3305.3.2 Design of concrete formwork.** Design of formwork, including but not limited to forms, shores, and shoring foundations, shall comply with ACI 318, Section 6.1.5, and the requirements of Sections 3305.3.2.1 through 3305.3.2.8 of this code.

**3305.3.2.1 Design drawings.** Site-specific formwork design drawings prepared by a registered design professional shall be required in the following cases:

1. For concrete formwork in a structure classified as a major building; or
2. Wherever the shore or form height exceeds 14 feet (4267 mm); or
3. Wherever the total vertical load on the forms exceeds 150 pounds per square foot (732 kg/m<sup>2</sup>); or
4. Wherever power buggies are used; or
5. Wherever multi-stage shores are used; or



6. Wherever the slab thicknesses or beam heights equal or exceed 10 inches; or
7. Wherever there are concentrated loads exceeding 2,000 pounds $\ddagger$  (907 kg) imposed on the formwork; or
8. Wherever there are loads $\ddagger$  imposed on existing structures in accordance with Section 3305.3.1.2.1.

**Exception:** Design drawings prepared by a registered design professional are not required for formwork installed in conjunction with slabs supported directly on grade or footings where such slab or footing does not impart any load on an adjacent structure.

**3305.3.2.2 Vertical loads.** Vertical loads shall include the total dead and live loads. Dead load shall include the weight of the formwork plus the weight of the reinforcement and fresh concrete. Live load shall allow for the weight of the workers and equipment, with allowance for impact, but in no case shall be less than 20 pounds per square foot (98 kg/m<sup>2</sup>).

**3305.3.2.3 Lateral concrete pressure.** Design of forms, ties and bracing shall satisfy the minimum lateral pressures of fresh concrete specified in Table 3305.3.2.3.

**3305.3.2.4 External lateral loads.** Braces and shores shall be designed to resist all external lateral loads, including, but not limited to, wind, cable tensions, inclined supports, dumping of concrete, and starting and stopping of equipment. In no case shall the assumed value of lateral load due to wind, dumping of concrete, and equipment acting in any direction at each floorline be less than 100 plf applied along the edge or 2 percent of total dead load of the floor, whichever is

greater. Except for foundation walls that are poured against a rigid backing, wall forms shall be designed for a minimum lateral load of 10 pounds per square foot (49 kg/m<sup>2</sup>), and bracing for wall forms shall be designed for a lateral load of at least 100 pounds per linear foot (148.8 kilograms per linear meter) of wall, applied at the top. The lateral load acting on walls greater than 14 feet (4267 mm) high shall be determined by analysis of conditions applicable to the site and building.

**3305.3.2.5 Special loads.** The formwork shall be designed for any special conditions of construction likely to occur, such as asymmetrical $\ddagger$  placement of concrete, impact of machine-delivered concrete, uplift and concentrated loads.

**3305.3.2.6 Shoring and bracing.** Shoring and bracing shall comply with Sections 3305.3.2.6.1 through 3305.3.2.6.4.

**3305.3.2.6.1 Approval.** When patented or commercial devices that are not susceptible to design are used for shoring, bracing, or splicing, they shall be approved by the commissioner.

**3305.3.2.6.2 Splices.** Splices shall develop the full strength of the spliced members.

**3305.3.2.6.3 Bracing.** Where shore height exceeds 10 feet (3048 mm), or when necessary to provide structural stability, diagonal bracing shall be provided. Struts, anchored into masonry or to panel joints of adjacent braced bays may be used to prevent buckling of individual members not supported by the diagonal bracing, but bracing an entire tier of shores with struts without diagonal bracing shall be prohibited unless the system can be demonstrated to be braced by other rigid construction.

**TABLE 3305.3.2.3**  
**MINIMUM LATERAL PRESSURES TO BE ASSUMED FOR FRESH CONCRETE WEIGHING 150 POUNDS PER CUBIC FOOT<sup>a, b, c</sup>**

TYPE OF WORK	MINIMUM LATERAL PRESSURE ASSUMED (PSF)	LIMITATIONS
Columns: Ordinary work with normal internal vibration	$p = 150 + (9000R/T)$	Maximum 3,000 psf or 150h, whichever is less
Walls: Rate of placement at 7 feet per hour or less	$p = 150 + (9000R/T)$	Maximum 2,000 psf or 150h, whichever is less
Walls: Rate of placement at greater than 7 feet per hour	$p = 150 + (43400/T) + (2800R/T)$	Maximum 2,000 psf or 150h, whichever is less
Slabs	$p = 150h$	None

For SI: 1 inch = 25.4 mm, 1 foot per second = 0.305 m/s, 1 pound per cubic foot = 16.02 kg/m<sup>3</sup>, 1 pound per square foot = 4.882 kg/m<sup>2</sup>, °C = (°F-32)/1.8.

where:

$R$  = rate of placement, feet per hour.

$T$  = temperature of concrete in the forms, °F.

$h$  = height of fresh concrete above point considered, feet.

- a. Allowances for change in lateral pressure shall be made for concrete weighing other than 150 pcf; for concrete containing pozzolanic additions or cements other than Type I, for concrete having slumps greater than 6 inches, or for concrete consolidated by revibration or external vibration of forms.
- b. Where retarding admixtures are employed under hot weather conditions, an effective value of temperature less than that of the concrete in the forms shall be used in the above formula.
- c. If retarding admixtures are used in cold weather, the lateral pressure may be assumed as that exerted by a fluid weighing 150 pcf.



**3305.3.2.6.4 Unbraced length of shores.** The unbraced length of shores shall not exceed the maximum length determined in accordance with the requirements of this code for the structural material used.

**3305.3.2.7 Foundations.** Foundations for shores more than 10 feet (3048 mm) high and supported on the ground shall be designed by a registered design professional.

**3305.3.2.8 Settlement.** Formwork shall be so constructed that vertical adjustments can be made to compensate for take-up and settlements. Wedges, jacks or other positive means shall be provided for this purpose.

**3305.3.3 Formwork inspection and observation.** Formwork shall be inspected and observed in accordance with the requirements of Sections 3305.3.3.1 and 3305.3.3.2.

**3305.3.3.1 Inspection.** Formwork, including shores, reshores, braces and other supports, shall be inspected prior to placement of reinforcing steel to verify that they conform to the construction documents and form design drawings. Such inspections shall be performed by a qualified person designated by the contractor; nothing shall prohibit the concrete safety manager from performing such inspection where so designated. Subsequently, inspections shall be performed by such person periodically during the placement of concrete. During and after concreting, the elevations, camber, and vertical alignment of formwork systems shall be inspected using tell-tale devices. A record of all such inspections shall be kept at the site available to the commissioner. The names of the persons responsible for such inspections and the foreman in charge of the formwork shall be posted in the field office.

**3305.3.3.2 Formwork observation.** In addition to the inspections by the contractor required pursuant to Section 3305.3.3.1, visual observations of the formwork for the general conformance with the design intent shall be performed by:

1. The formwork designer;
2. An employee of the formwork designer under his or her direct supervision;
3. A registered design professional retained by the formwork designer; or
4. An employee of such retained registered design professional under the direct supervision of such retained registered design professional.

**Exceptions:** Formwork observation pursuant to Section 3305.3.3.2 shall not be required for:

1. Formwork that does not require design drawings pursuant to Section 3305.3.2.1; and
2. One- two- and three-family dwellings, and accessory uses to such buildings.

**3305.3.3.2.1 Intervals.** Formwork shall be observed at intervals permitting observation of representative configurations throughout the project duration. The

formwork designer shall maintain a log of such observations at the construction site. At a minimum, observations shall be made:

1. Immediately after formwork related incidents or violations are issued; and
2. When concrete construction operations are significantly modified such as changes to form materials, concrete placement cycle, or form and support layout prior to use of the change.

**3305.3.3.2.2 Discrepancies from the formwork design.** Where the individual performing the formwork observation pursuant to Section 3305.3.3.2 discovers a discrepancy from the formwork design, such discrepancy shall be immediately brought to the attention of the concrete contractor. The concrete contractor shall be responsible for correcting the discrepancy. In addition, the site safety manager, site safety coordinator, and concrete safety manager, as applicable, shall be notified of discrepancies from the formwork design that relate to site safety. Follow-up observations to confirm corrective action has been taken shall be made by the formwork designer or his or her qualified designee pursuant to Section 3305.3.3.2.

**3305.3.3.2.3 Hazardous formwork conditions.** Where an observed formwork condition hazardous to life, safety, or health is not immediately corrected by the responsible contractor, the formwork designer or his or her qualified designee pursuant to Section 3305.3.3.2 shall immediately report such hazardous formwork condition and such failure to correct the hazardous formwork condition to the commissioner.

**3305.3.4 Construction.** Concrete formwork, including but not limited to forms, shores, and shoring foundations, shall be constructed in conformance with the design drawings, where such drawings are required by Section 3305.3.2.1, and shall also be constructed to comply with the requirements of Sections 3305.3.4.1 through 3305.3.4.5.

**3305.3.4.1 Field-constructed lap splices.** Field-constructed lap splices, other than approved devices, shall not be used more often than for every other shore under slabs or for every third shore under beams and shall develop the full strength of the members. Such spliced shores shall be uniformly distributed throughout the work. Splices shall not be located near the midheight of the shores unless lateral support is provided, nor midway between points of lateral support.

**3305.3.4.2 Vertical shores.** Vertical shores incorporated in multi-stage shores shall be set plumb and in alignment with lower tiers so that loads from upper tiers are transferred directly to the lower tiers, or adequate transfer members shall be provided. Provision shall be made to transfer the lateral loads to the ground or to completed construction of adequate strength. Vertical shores shall be so erected that they cannot tilt, and shall have firm bearing. Inclined shores and the bearing ends of all shores shall be braced against slipping or

sliding. The bearing surfaces shall be cut square and have a tight fit at splices.

**3305.3.4.3 Runways.** Runways for moving equipment shall be provided with struts or legs as required and shall be supported directly on the formwork or structural member and not on the reinforcement.

**3305.3.4.4 Unsafe conditions.** Any unsafe condition or necessary adjustment revealed by inspection shall be remedied immediately. If, during construction, any weakness develops and the formwork shows any undue settlement or distortion, the work shall be stopped, the affected construction removed if permanently damaged, and the formwork strengthened.

**3305.3.4.5 Perimeter formwork.** Horizontal formwork deck panels and beam formwork located within 16 feet (4877 mm) from the building perimeter shall be positively attached to all formwork support systems at a minimum.

**3305.3.5 Removal of forms and shoring.** The removal of forms and shoring shall comply with the requirements of Sections 3305.3.5.1 through 3305.3.5.6.

**3305.3.5.1 Removal schedule.** Before starting construction, the contractor shall develop a procedure and schedule for removal of shores and installation of reshores and for calculating the loads transferred to the structure during the process.

**3305.3.5.1.1 Data and analysis.** The structural analysis and concrete strength data used in planning and implementing form removal and reshoring shall be furnished by the registered design professional responsible for the removal schedule to the commissioner when so requested.

**3305.3.5.1.2 Support and removal.** No construction loads shall be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure in combination with the remaining forming and shoring system has sufficient strength to support safely its weight and the loads placed thereon.

**3305.3.5.1.3 Concrete strength.** Sufficient strength shall be demonstrated by structural analysis of the proposed loads, the strength of the forming and shoring system, and concrete strength data. Concrete strength data shall be based on tests of field-cured cylinders or, when approved by the commissioner, on other procedures for evaluating concrete strength.

**3305.3.5.2 Construction loads.** No construction loads exceeding the combination of superimposed dead load plus specified live load shall be supported on any unshored portion of the structure under construction, unless analysis indicates adequate strength to support such additional loads.

**3305.3.5.3 Prestressed members.** Form supports for prestressed concrete members shall not be removed until sufficient prestressing has been applied to prestressed members to carry their dead load and anticipated construction loads.

**3305.3.5.4 Manner of removal.** Forms shall be removed in such a manner as to assure the complete safety of the public and property.

**3305.3.5.5 Shores support.** Where the structure as a whole is supported on shores, beam and girder sides, columns and similar vertical forms may be removed after the concrete is sufficiently hard to withstand damage from the removal. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support safely their weight and the load thereon.

**3305.3.5.6 Control tests.** The results of control tests, including concrete cylinder specimens prepared in accordance with ASTM C 31, cast-in-place cores, or other device that will produce test specimens representative of the condition of the concrete in place, of suitable size and proportions, and approved by the registered design professional of record shall be evidence that the concrete has attained sufficient strength or the strength as may be specified on the drawings.

**3305.3.6 Reshoring.** Reshoring shall be provided to support the construction where forms and shores are stripped before the concrete has attained sufficient strength to support the superimposed loads due to construction above. Reshoring shall comply with Sections 3305.3.6.1 through 3305.3.6.8.

**3305.3.6.1 Reshores limitations.** Reshores shall comply with the requirements of Sections 3305.3.6.1.1 through 3305.3.6.1.7.

**3305.3.6.1.1 Secureness of reshores.** Reshores of wood or metal shall be screw adjusted or jacked and locked and wedged to make them secure. Reshores shall not be jacked or screwed so tightly that they preload the floor below or remove the normal deflection of the slab above.

**3305.3.6.1.2 Reshores in proximity to unenclosed perimeters.** Reshores within 10 feet (3048 mm) of an unenclosed perimeter of a building shall be secured to prevent them from falling off the building.

**3305.3.6.1.3 Wedges.** Wedges shall not be used within 10 feet (3048 mm) of the façade or at such other locations as determined by the commissioner.

**3305.3.6.1.4 Stresses.** In no case shall shores be so located as to alter the pattern of stresses determined in the original structural analysis or to induce tensile stresses where reinforcing bars are not provided.

**3305.3.6.1.5 Angle to surface.** Reshores shall be perpendicular to the surface that they are supporting.

**3305.3.6.1.6 Adjusting devices.** Adjusting devices shall not be used if heavily rusted, bent, dented, rewelded or having broken weldments or other defects.

**3305.3.6.1.7 Metal shoring and accessory parts.** Metal shoring and accessory parts shall be fully operative when in use.

**3305.3.6.2 Site safety provisions.** Reshoring shall comply with the requirements of Sections 3305.3.6.2.1 through 3305.3.6.2.3.

**3305.3.6.2.1 Emergency.** Extra shores or material and equipment that might be needed in an emergency shall be furnished.

**3305.3.6.2.2 Stripping.** Care shall be taken while stripping is underway to insure that material does not fall off the building.

**3305.3.6.2.3 Building materials.** Building materials shall be properly piled and tied or contained.

**3305.3.6.3 Bracing.** Lateral bracing shall be provided during reshoring operations, and reshores shall be located as close as practical to the same position on each floor to provide continuous support from floor to floor.

**3305.3.6.4 Reshoring beam and girder construction.** Where reshoring of beam and girder construction is required, the forms shall not be removed from more than one girder at a time, and the girder shall be reshored before any other supports are removed. After the supporting girders are reshored, the form shall be removed from one beam with its adjacent slabs and the beam shall be reshored before any other supports are removed. Slabs spanning 10 feet (3048 mm) or more shall be reshored along the centerline of the span.

**3305.3.6.5 Reshoring flat slabs.** Where reshoring of flat-slab construction is required, the formwork cannot be stripped until the concrete has acquired sufficient strength to safely support its weight and the load thereon, or temporary preshores are provided supporting the slab at intervals of no more than 8 feet (2438 mm) on center to be replaced by reshores prior to placing concrete on the floor above. Reshores must be installed and remain in place until the concrete reaches full or sufficient strength to sustain the superimposed loads to which the concrete will be subjected.

**3305.3.6.6 Stripping operation.** Debris generated as a result of stripping operations shall be immediately contained and removed at reasonable intervals. Stripping operations on concrete structures shall not be performed more than three stories below the story being formed.

**3305.3.6.7 Prestressed construction.** Solid safety shields shall be provided at end anchorages of prestressing beds, or where necessary, for protection against breakage of prestressing strands, cables, or other assemblies during prestressing or casting operations.

**3305.3.6.8 Reshoring schedule.** A signed and sealed reshoring schedule shall be provided and maintained at the construction site whenever reshoring is employed.

**Exception:** A separate reshoring schedule is not required when the required reshoring information is

covered on the approved construction documents prepared by the applicant of record.

**3305.3.7 Alternate methods.** The contractor may submit alternate methods of stripping, shoring, reshoring, and strength control for approval by the registered design professional of record, subject to review by the commissioner.

**3305.4 Aluminum erection.** In addition to the requirements of Section 2002, the erection of aluminum used for structural purposes shall comply with the requirements of Sections 3305.4.1 through 3305.4.4.

**3305.4.1 Plumb.** All framework shall be carried up true and plumb.

**3305.4.2 Temporary bracing.** Temporary bracing shall be provided to support all loads imposed upon the framework during construction that are in excess of those for which the framework was designed.

**3305.4.3 Temporary connections.** As erection progresses, the work shall be securely bolted or welded to resist all dead loads, wind, and erection stresses.

**3305.4.4 Alignment.** The structure shall be properly aligned before riveting, permanent bolting, or welding is performed.

**3305.5 Masonry erection.** The requirements of Section 2104.6 shall apply.

## SECTION BC 3306 DEMOLITION

**3306.1 Scope.** All full demolition and partial demolition operations shall be performed in accordance with the requirements of this section.

**3306.2 Protection of pedestrians and adjoining property.** Demolition operations shall not commence until the applicable pedestrian and adjoining property protection is in place as required by Sections 3307, 3308 and 3309.

**3306.2.1 Safety zone.** A safety zone shall be provided around all demolition areas to prevent persons other than workers from entering such zone. Where demolition occurs on the exterior of a building, such zone shall be approved by the commissioner prior to the commencement of demolition. Where mechanical demolition equipment, other than handheld devices, is to be used for the full demolition of a building, the safety zone shall be equal to or greater than half the height of the building to be demolished; such safety zone may be reduced by the same ratio as the building is being demolished.

**Exception:** Approval of the commissioner is not required for a safety zone established for demolition on the exterior of a building, provided the work is a minor alteration or ordinary repair and is accomplished without any mechanical demolition equipment, other than handheld devices.

**3306.3 Notification.** The permit holder shall notify the department and adjoining building owners prior to the com-



mencement of full and partial demolition operations in accordance with Sections 3306.3.1 and 3306.3.2.

**Exceptions:**

1. Notification to the department or adjoining owners is not required for partial demolition operations limited to the interior components of a building provided no mechanical demolition equipment, other than handheld devices, are used.
2. Notification to the department or adjoining owners is not required for partial demolition that occurs on the exterior of a building, provided such work is a minor alteration or ordinary repair, and is accomplished without any mechanical demolition equipment, other than handheld devices.

**3306.3.1 Notification of the department.** The permit holder shall notify the department via phone or electronically at least 24 hours, but no more than 48 hours prior to the commencement of such work.

**3306.3.2 Notification of adjoining property owners.** Adjoining property owners shall be notified of upcoming demolition operations in writing not less than 10 days prior to the scheduled starting date of the demolition. The written notice shall provide a description of the work to be performed, the timeframe and schedule, and contact information of the person causing the demolition and of the department. Demolition or removal work that is to be done with the use of explosives shall also be subject to the notification requirements set forth in the *New York City Fire Code*.

**3306.4 Mechanical demolition equipment.** Where mechanical demolition equipment, other than handheld devices, is to be used in the full or partial demolition of a building or structure, or is to be used to remove debris or move material, approval of the commissioner for the use of the mechanical demolition equipment must be obtained prior to the commencement of demolition operations.

**3306.5 Submittal documents for demolition.** Full and partial demolition operations shall be conducted in accordance with submittal documents. Such submittal documents shall comply with Sections 3306.5.1 through 3306.5.3.

**Exceptions:** Section 3306.5 shall not apply to:

1. Demolitions performed as emergency work pursuant to Section 28-215.1 of the *Administrative Code* when such work is monitored by a qualified person with experience in demolition operations who is employed by the city agency that has been directed to perform or arrange for the performance of such work. If the department or such city agency determines that there is a need for supervision of the work by a registered design professional, such city agency shall retain a registered design professional or cause a registered design professional to be retained to supervise the demolition operations.
2. The full demolition of a detached one-, two-, or three-family dwelling, or both halves of a semi-detached one-, two-, or three-family dwelling, or a detached accessory use to a one-, two-, or three-family dwelling, provided such dwelling or accessory use is three stories or fewer in height, and also provided that the demolition is to be accomplished without any mechanical demolition equipment, other than handheld devices.

ily dwelling, provided such dwelling or accessory use is three stories or fewer in height, and also provided that the demolition is to be accomplished without any mechanical demolition equipment, other than handheld devices.

3. The removal, with mechanical demolition equipment, of foundations and landscaping elements, including but not limited to foundation walls, slabs, stoops, driveways, or pools supporting or accessory to a detached or semi-detached one-, two-, or three-family dwelling.
4. The full demolition of a fully detached building that is three stories or fewer and with a floor area of 5,000 square feet (464.5 m<sup>2</sup>) or less per story, provided such demolition is to be accomplished without any mechanical demolition equipment, other than handheld devices.
5. Partial demolition operations accomplished without any mechanical demolition equipment, other than handheld devices, provided such work is a minor alteration or ordinary repair.

**3306.5.1 Required documents.** Submittal documents shall be approved by the department before demolition work begins. Such submittal documents shall be signed, sealed, and submitted by a registered design professional and shall contain, at a minimum, the following:

1. Plans, sections, and details of the building or portion thereof, to be demolished clearly showing the extent and sequence of the demolition;
2. Bracing and shoring necessary to support all demolition operations, and adjoining ground or structures as needed, through all sequences of the demolition;
3. Where mechanical demolition equipment, other than handheld devices, is to be used, a listing and description of all such proposed equipment to be used in the demolition, including the scope of equipment work and positioning of equipment on the existing structure. The description of the equipment shall include calculations showing the adequacy of the existing structure to support loads imposed by such equipment. If more than one piece of demolition equipment is proposed to be used at the same time, the effect of the simultaneous loads imposed on the existing structure shall be described and investigated; and
4. A description of compliance with the applicable provisions of Section 3306.9 of this code.

**Exception:** For a partial demolition using mechanical demolition equipment, the bracing and shoring details required by Item 2 above may be included on signed and sealed shop drawings to be kept on site, separate and apart from the submittal documents, provided the allowance for shop drawings is designated on the submittal documents.

**3306.5.1.1 Submittal documents for full or partial demolition using mechanical equipment other than handheld.** Submittal documents for full or partial



demolition using mechanical equipment other than handheld shall be signed, sealed and submitted by a registered design professional.

**3306.5.2 Maintenance of submittal documents.** The approved set of submittal documents shall be kept at the site at all times and be accessible for inspection in accordance with Section 3301.7. It shall be a violation of this code to use mechanical equipment, whether handheld or other than handheld, to perform full or partial demolitions unless the approved submittal documents required by Section 3306.5.1 are available for inspection. Failure to make submittal documents available on site may result in the issuance of a stop work order.

**3306.5.3 Filing requirements.** Where submittal documents are required in connection with full or partial demolition in accordance with Section 3306.5, applications shall be filed by the registered design professional in accordance with Article 104 of Chapter 1 of Title 28 of the *Administrative Code* and shall be approved prior to issuance of the work permit.

**3306.6 Special inspection.** Demolition shall be subject to special inspection in accordance with Chapter 17.

**3306.7 Demolition of weakened structures.** Where a structure to be demolished has been partially wrecked or weakened by fire, flood, explosion, age, or other causes, it shall be shored or braced to the extent necessary to permit orderly full demolition or partial demolition without collapse. The necessary measures to ensure a safe demolition shall be determined by the owner's registered design professional and shall be approved by the commissioner.

**Exception:** Shoring or bracing are not required for the full demolition of a building, subject to the approval of the commissioner, provided:

1. The demolition is conducted with mechanical demolition equipment, other than handheld devices; and
2. No demolition operation occurs, or equipment is located, within the structure of the building.

**3306.8 Demolition sequence.** Any structural member that is being dismembered shall not support any load other than its own weight. No wall, chimney, or other structural part shall be left in such condition that it may collapse or be toppled by wind, vibration or any other cause. The method of removal of any structural member shall not destabilize remaining members. All handling and movement of material or debris shall be controlled such that it will not develop unaccounted impact loads on the structure.

**3306.8.1 Structural steel, reinforced concrete, and heavy timber buildings.** Structural steel, reinforced concrete, and heavy timber buildings, or portions thereof, shall be demolished column length-by-column length and tier-by-tier. Structural members shall be chained or lashed in place to prevent any uncontrolled swing or drop.

**Exception:** Where the design applicant has demonstrated the adequacy of alternate means of demolition through plans, calculations, or the establishment of safety zones, as appropriate, the commissioner may accept such alternative means of demolition.

**3306.8.2 Masonry buildings with wooden floors.** Demolition of masonry buildings with wooden floors shall comply with the following requirements:

1. Demolition of walls and partitions shall proceed in a systematic manner, and all work above each tier of floor beams shall be completed before any of the supporting structural members are disturbed.
2. Sections of masonry walls shall not be loosened or permitted to fall in such masses as to affect the carrying capacity of floors or the stability of structural supports.
3. No section of wall with a height more than 22 times its thickness shall be permitted to stand without bracing designed by a registered design professional.

**3306.9 Safeguards.** Demolition shall be conducted in accordance with the requirements of Sections 3306.9.1 through 3306.9.14.

**3306.9.1 Utilities and service lines.** The requirements of Section 3303.2 shall apply.

**3306.9.2 Party wall exits, fire exits.** The requirements of Section 3303.9 shall apply.

**3306.9.3 Dust.** Dust producing operations shall be wetted down to the extent necessary to control the dust.

**3306.9.4 Water accumulation.** The requirements of Section 3303.14 shall apply.

**3306.9.5 Temporary elevators and standpipe systems.** The requirements of Sections 3303.8 and 3303.12 shall apply.

**3306.9.6 Sprinkler systems.** The requirements of Section 3303.7.4 shall apply.

**3306.9.7 Use of explosives.** The use of explosives in demolition operations shall conform to the requirements and limitations imposed by the *New York City Fire Code* and Section 3312.

**3306.9.8 Hazards to be removed.** Prior to the commencement of demolition operations, hazards shall be removed in accordance with Sections 3306.9.8.1 through 3306.9.8.4.

**3306.9.8.1 Combustible content.** Prior to the commencement of demolition operations, the area authorized to be demolished by the work permit shall be thoroughly cleaned of combustible content and debris, including but not limited to building contents and exterior finishes, down to the structural elements.

**3306.9.8.2 Asbestos.** Prior to the commencement of demolition operations, all asbestos shall be removed from the area authorized to be demolished by the department work permit, and certification to that effect shall be filed with the department and the Department of Environmental Protection. Such asbestos removal shall be in accordance with Section 28-106 of the *Administrative Code* and rules promulgated by the commissioner of the Department of Environmental Protection.

**3306.9.8.3 Glass.** Prior to the commencement of demolition operations, all glass located in the area authorized to be demolished by the work permit, including but not limited to glass in windows, doors, skylights, and fixtures, shall be removed.

**Exception:** Demolition operations relating to the alteration, maintenance, or repair of a façade.

**3306.9.8.4 Steam and fuel.** Prior to the commencement of demolition operations, all pipes, tanks, boilers, or similar devices containing steam or fuel and located in the area authorized to be demolished by the work permit shall be purged of such steam or fuel.

**Exception:** Pipes, tanks, boilers, or similar devices containing steam or fuel located in the area authorized to be demolished by the work permit and which will not be disturbed during the course of the demolition operation may, in lieu of being purged, be safeguarded so as to prevent their being damaged during the course of demolition operations.

**3306.9.9 Stairs.** All enclosed vertical shafts and stairs shall be maintained enclosed at all floors except the uppermost floor being demolished, and all work on the uppermost floor shall be completed before stair and shaft enclosures on the floor below are disturbed. All hand rails and banisters shall be left in place until actual demolition of such floor is in progress.

**3306.9.10 Floors.** The safeguards of Sections 3306.9.10.1 through 3306.9.10.3 shall apply to demolition operations involving floors.

**3306.9.10.1 Bearing partitions and headers.** No bearing partition shall be removed from any floor until the floor framing system on the floor above has been removed and lowered. All header beams and headers at stair openings and chimneys shall be carefully examined and, where required, shall be shored from the cellar floor through successive floors. All operations shall be continually monitored by a qualified person designated by the permit holder as the work progresses to detect any hazards that may develop.

**3306.9.10.2 Floor openings.** Openings in any floor shall not aggregate more than 25 percent of the area of that floor unless it can be shown by submission from a registered design professional to the satisfaction of the commissioner that larger openings will not impair the stability of the structure.

**3306.9.10.3 Protection of floor openings.** Floor openings used for the removal of debris shall comply with Section 3306.9.12.1. Every opening not used for the removal of debris in any floor shall be solidly planked over by planking not less than 2 inches (51 mm) in thickness, or equivalent solid material, and laid close.

**3306.9.11 Storage of material.** Material shall not be stored on catch platforms, working platforms, floors, or stairways of any structure, except that any one floor of a building to be demolished may be used for the temporary storage of material when such floor can be evaluated by a registered design professional and proven to be of ade-

quate strength to support one and one-half times the load to be superimposed. Such evaluation by the registered design professional shall be maintained by the permit holder and made available to the department upon request.

Storage spaces shall not interfere with access to any stairway or passageway, and suitable barricades shall be provided so as to prevent material from sliding or rebounding into any space accessible to the public. All material shall be safely stored or piled in such storage locations in a manner that will not overload any part of the structure or create any hazard.

**3306.9.11.1 Examination of connections.** Before any material is stored on any floor, the existing flooring adjacent to bearing walls, shear walls, beams and columns shall be removed and the connections of the floor framing system to the bearing walls, shear walls, beams and columns shall be carefully examined by a competent person designated by the permit holder to ascertain their condition and adequacy to support such material. If the connections are found to be in poor condition or inadequate to support the stored material, no material shall be deposited on the floor until these connections are shored from the cellar floor through each successive floor or otherwise strengthened to safely support such material.

**3306.9.11.2 Removal of floor slabs for storage.** In buildings of noncombustible construction, floor slabs to an elevation of not more than 25 feet (7620 mm) above the legally established curb level may be removed to provide temporary storage for debris, provided that:

1. The stored debris is piled with sufficient uniformity to prevent lateral displacement of interior walls or columns as determined by a registered design professional.
2. The height of the piled material will not burst the exterior walls due to horizontal loading as determined by a registered design professional.
3. The operation does not otherwise endanger the stability of the structure.

**3306.9.11.3 Cellar or basement storage.** Debris stored in the cellar or basement shall not be piled above the level of the adjacent exterior grade unless the demolition contractor provides sheet-piling, shoring, bracing, or such other means necessary to insure the stability of the walls and to prevent any wall from collapsing due to horizontal loading created by the debris as determined by a registered design professional. Where debris is stored against a party wall, the requirements of Section 3306.9.11.4 shall also apply.

**3306.9.11.4 Examination of party walls.** Party walls shall be carefully examined by a competent person designated by the permit holder to ascertain the condition and adequacy of the party wall prior to the placement of any material that will impose a load upon such party wall. If the party wall is to be found to be in poor condi-

tion or inadequate to support the stored material, no material shall be deposited on the floor until the party wall is shored or otherwise strengthened as determined by a registered design professional to safely support such material.

**3306.9.12 Removal of material.** Debris, bricks, and similar material shall be removed through openings in the floors of the structure, or by means of chutes, buckets, or hoists that comply with the provisions of this chapter.

**3306.9.12.1 Protection of floor openings.** Every opening in a floor used for the removal of debris shall be tightly enclosed with a shaftway, extending from floor to floor, with such shaftway enclosed with:

1. Planking not less than 2 inches (51 mm) in thickness, or equivalent solid material; or
2. Where the opening is used for the removal of noncombustible material, wire mesh may be utilized in lieu of planking, provided such mesh is not less than number 18 gage wire mesh, with openings in the wire no longer than  $\frac{1}{2}$  inch (13 mm), and also provided that the wire mesh is securely attached, in accordance with drawings developed by a registered design professional, to the shaftway so that the wire mesh enclosure in any location does not deflect more than 2 inches (51 mm) when a force of at least 200 pounds (890 n) is applied along any horizontal portion of such wire mesh enclosure.

**Exceptions:**

1. In buildings not more than six stories in height, a shaftway is not required. Instead openings in the floor shall be solidly planked over while not in use by planking not less than 2 inches (51 mm) in thickness, or equivalent solid material, and laid close.
2. A shaftway is not required at the working deck. Instead, openings in the working deck shall be solidly planked over while not in use by planking not less than 2 inches (51 mm) in thickness, or equivalent solid material, and laid close.

**3306.9.12.1.1 Temporary removal of protection.**

Wherever such protection required by Section 3306.9.12.1 has been temporarily removed to permit debris removal, the floor opening shall be protected by a guardrail system that meets the requirements of Sections 3308.7.1 through 3308.7.5. Such protection required by Section 3306.9.12.1 shall be promptly replaced in position upon the ceasing of such work at the end of each workday.

**3306.9.12.2 Protection of wall openings.** In any buildings more than 25 feet high (7620 mm), any window or other exterior wall opening that is within 20 feet (6096 mm) of a floor opening used for the passage of debris from levels above shall be solidly boarded up or otherwise substantially covered, unless such window or opening is so located as to preclude the possibility of

any person being injured by material that may fall from such window or opening.

**3306.9.13 Rodent extermination.** A licensed exterminator shall effectively treat the premises for rodent extermination as per the requirements of the Department of Health and Mental Hygiene.

**Exception:** Partial demolition operations.

**3306.9.14 Chimneys.** Where brick or masonry chimneys cannot be safely toppled or dropped, all materials shall be dropped down on the inside of such chimneys.

**3306.10 Removal of foundations and slabs.** Where a building, or any portion, has been demolished to grade, the floor slab or foundation of such building, or portion, shall be removed and the site backfilled to grade.

**Exceptions:**

1. Cellar floors may remain provided the cellar floor slab is broken up to the extent necessary to provide ground drainage and prevent accumulation of water, and also provided that all fixtures or equipment that would cause voids in the fill are removed.
2. Where portions, other than a cellar floor, are to remain and covered with backfill, a waiver approved by the commissioner shall be obtained. Drawings prepared by a registered design professional depicting the remaining buried structure shall be submitted with the waiver request.
3. Where a floor slab or foundation is to remain and not be backfilled, a waiver approved by the commissioner shall be obtained. Such request for waiver shall be accompanied by a statement and drawings prepared by a registered design professional demonstrating the necessity for retaining the existing floor slab or foundation for future construction or site remediation, as well as demonstrating positive cellar drainage to an approved place of disposal.

**3306.11 Completion of demolition operations.** All work required for structural stability and permanent waterproofing of adjacent buildings must be completed prior to demolition sign-off.

## SECTION BC 3307 PROTECTION OF PEDESTRIANS

**3307.1 Scope.** Pedestrians shall be protected during construction or demolition activities as required by this section and by the Department of Transportation.

**3307.2 Streets, including sidewalks, walkways, and pathways.** Streets, including sidewalks, as well as walkways and pathways, either within the public way or within a site, shall meet the requirements of Sections 3307.2.1 through 3307.2.6, and the requirements of the Department of Transportation.

**3307.2.1 Obstruction of streets or sidewalks.** The requirements of the Department of Transportation shall apply with regard to the closing of streets or sidewalks, or to the obstruction of any part thereof.



**3307.2.2 Temporary public walkway in the street.**

Where authorized by the Department of Transportation, a temporary walkway open to the public may be provided in the street in front of the site. Such temporary walkway shall be protected in accordance with the requirements of the Department of Transportation.

**3307.2.3 Temporary public walkway within the site.**

Where authorized by the commissioner, a temporary walkway open to the public may be provided through a site that is otherwise fenced and closed to the public. Such temporary walkway shall be:

1. Protected by a sidewalk shed, or where acceptable to the commissioner, provided with overhead protection and lighting equivalent to that afforded by a sidewalk shed;
2. Enclosed along the side facing the site with a solid fence that meets the requirements of Section 3307.7. Where the sidewalk shed or equivalent overhead protection extends beyond the height of the fence, the gap shall be enclosed with a wire screen comprised of not less than number 18 gage wire mesh, or equivalent synthetic netting, with openings in the wire or synthetic mesh no larger than  $\frac{1}{2}$  inch (13 mm); and
3. Enclosed along the side facing the street with a wire screen comprised of not less than number 18 gage wire mesh, or equivalent synthetic netting, with openings in the wire or synthetic mesh no larger than  $\frac{1}{2}$  inch (13 mm), or where a special hazard exists, protected in accordance with Section 3307.4.7.

**3307.2.4 Pathways.** Where a means of ingress/egress to the property remains open to the public during the course of construction or demolition, walkways, pathways, and similar areas within the property line that provide a path of travel between the required means of ingress/egress and the public sidewalk or temporary walkway shall remain open.

**3307.2.5 Foot bridges.** Where foot bridges are utilized as part of a sidewalk, walkway, or pathway, they shall be provided with guardrails for the entire length, and shall have cleats to prevent slipping. Where planks are used to pave the walkway of the foot bridge, the planks shall be laid close and securely fastened to prevent displacement. Planks shall be of uniform thickness, and all exposed ends of ramps shall be provided with beveled fillers to eliminate tripping hazards.

**3307.2.6 Requirements for sidewalks, temporary walkways, foot bridges, and pathways.** Sidewalks, walkways, foot bridges, and pathways that remain open to the public shall be accessible and shall be provided with:

1. A clear path, free of obstruction, at least 5 feet (1524 mm) in width;
2. A durable walking surface capable of supporting all imposed loads and in no case shall the design live loads be less than 150 pounds per square foot (732.3 kg/m<sup>2</sup>);

3. Mirrors at all blind corners;
4. For a temporary walkway or foot bridge where there is a change in elevation along the walkway or foot-bridge, a ramp with a running slope not steeper than one unit vertical in 12 units horizontal (8-percent slope) with a level landing at least 5 feet long at the top and bottom of each run; and
5. For a temporary walkway or foot bridge where the running slope of such walkway or foot bridge is steeper than one unit vertical in 20 units horizontal (5-percent slope) and there is a total rise greater than 6 inches (152 mm), handrails.

**Exception:** Where it is not possible to provide the clear path to the extent required by item number 1 above, the sidewalk, or pathway shall be kept open to the extent required by the Department of Transportation as well as comply with applicable provisions of the *ADA Accessibility Guidelines for Buildings and Facilities* and/or the *ADA Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way*, as applicable.

**3307.3 Sidewalk sheds and fences.** Sidewalk sheds shall be provided as required by Section 3307.6. Fences shall be provided as required by Section 3307.7.

**3307.4 Warning signs, personnel, and barriers.** Warning signs, personnel, or barriers shall be provided to protect the public from hazards generated by construction or demolition activity in or adjacent to a public way as set forth in Sections 3307.4.1 through 3307.4.7.

**3307.4.1 Obstructions and openings.** Obstructions or openings located in a public way shall be marked and guarded by barriers, flags, or signs in accordance with the requirements of the Department of Transportation.

**3307.4.2 Dangerous areas.** In areas where special danger to the public exists, including but not limited to vehicle entrances and exits, hoisting areas, points of storage of explosives or highly flammable material, blasting areas, or discharge ends of chutes, descriptive warning signs shall be provided in accordance with the requirements of the Department of Transportation.

**3307.4.3 Vehicular traffic.** Whenever any work is being performed over, on, or in close proximity to a highway, street, or similar public way, control and protection of traffic shall be provided by barriers, signals, signs, flag-person, or other devices, equipment, and personnel in accordance with the requirements of the Department of Transportation.

**3307.4.4 Areas open to persons other than workers.** A flagperson shall be provided whenever intermittent operations are conducted on, or adjacent to, areas open to use by persons other than workers, or when dangerous operations, such as blasting, may affect such areas. Where required by the Department of Transportation, designated personnel shall also be provided in addition to flag persons.

**3307.4.5 Additional signs.** In addition to the requirements of this section, information panels and signs shall also be provided as required by Sections 3301.9 and 3301.10.



**3307.4.6 Prohibited signs.** No illuminated business or advertising sign shall be permitted on any protective structure required by this section. Other than as specified in Sections 3301.9 or 3301.10 there shall be no sign, information, pictorial representation, or any business or advertising messages posted on a sidewalk shed, bridge, fence, or other protective structure listed in this section that is erected at the construction or demolition site.

**3307.4.7 Work or storage zones.** Where work or storage related to the construction or demolition of a building or structure is occurring adjacent to a sidewalk shed or equivalent overhead protection, and such area is not closed with a fence in accordance with Section 3307.7 or a permanent façade, a solid barrier extending at least 4 feet (1219 mm) in height from the level of the ground shall be provided. The space between the top of the barrier and the deck of the overhead protection shall be enclosed with a wire screen comprised of not less than number 18 gage wire mesh, or equivalent synthetic netting, with openings in the wire or synthetic mesh no larger than  $\frac{1}{2}$  inch (13 mm).

**Exception:** In the area where a material hoist, personnel hoist, hoistway, or chute is located, the solid barrier shall extend from level of the ground to the deck of the overhead protection.

**3307.5 Watchperson and flagperson.** Watchpersons shall be provided as required by Section 3303.3. Flagpersons shall be provided as required by Section 3307.4.

**3307.6 Sidewalk sheds.** Sidewalk sheds shall be provided as required by this section to protect pedestrians from construction or demolition operations.

**3307.6.1 Permit.** No sidewalk shed shall be installed without a permit in accordance with the requirements of Chapter 1 of Title 28 of the *Administrative Code*.

**3307.6.2 Where required.** A sidewalk shed shall be installed and maintained to protect all sidewalks, walkways, and pathways within the property line of a site, and all public sidewalks that abut the property, as follows:

1. When such sidewalk, walkway, or pathway is to be located immediately below a scaffold, mast climber, or chute. The sidewalk shed shall be installed prior to the installation of such equipment and shall not be removed until such equipment has been dismantled and/or removed from the area being protected;
2. When a structure higher than 40 feet (12 192 mm) or greater is to be constructed, and the sidewalk, walkway, or pathway is within a perpendicular distance from the new structure that is equal to or less than half the height of the new structure. The sidewalk shed shall be installed when the structure reaches the planned height of the shed. Such shed shall not be removed until the structure is enclosed, all exterior work has been completed and the sash is glazed above the second story, the façade has been cleaned down, and all exterior chutes, scaffolds, mast climbers, and hoisting equipment have been dismantled and removed from the site;

3. When a portion of a façade over 40 feet (12 192 mm) above curb level is to be constructed, altered, maintained, or repaired, or a vertical or horizontal enlargement is to occur at a height over 40 feet (12 192 mm) above curb level, and the sidewalk, walkway, or pathway is within a perpendicular distance from the structure that is equal to or less than half the height of such façade work or vertical or horizontal enlargement. The sidewalk shed shall be installed prior to the commencement of work at a height greater than 40 feet (12 192 mm) above curb level. Such shed shall not be removed until the building is enclosed, all exterior work has been completed and the sash is glazed above the second story, the façade has been cleaned down, and all exterior chutes, scaffolds, mast climbers, and hoisting equipment have been dismantled and removed from the site; or
4. When a structure higher than 25 feet (7620 mm) is to undergo a full demolition, or when exterior partial demolition, other than that performed in conjunction with the construction, alteration, maintenance, or repair of a façade, is to occur at a height greater than 25 feet (7620 mm) above curb level. The sidewalk shed shall be installed prior to the commencement of demolition work. Such shed shall remain in place until the building has been razed to the height of the shed, or where the building is not being fully demolished, until all demolition work has been completed and all exterior chutes, scaffolds, mast climbers, and hoisting equipment have been dismantled and removed from the site.

**Exceptions:** Except where specifically required by the commissioner to protect the public from unique hazards at the site, sidewalk sheds are not required for:

1. Sidewalks, walkways, and pathways that are closed, for their full width, to the public;
2. Temporary walkways in accordance with Section 3307.2.3 that are provided with lighting and overhead protection equivalent to that afforded by a sidewalk shed;
3. Inspections, including a façade inspection, provided no work occurs during the inspection;
4. Sign hanging occurring by or under the direct and continuing supervision of a licensed sign hanger;
5. Window washing;
6. Work confined to the roof of an existing building, provided the edge of the roof is enclosed to a height of 42 inches (1067 mm) with a solid parapet or vertical safety netting meeting the requirements of Section 3308.5; or
7. Subject to the approval of the commissioner, work of limited scope and duration provided that:
  - 7.1. During the course of the work the area immediately under the work zone is temporarily closed to the public by means of barriers

ers, cones, or caution tape, and flagpersons are provided to direct pedestrian traffic;

- 7.2. At the end of the day the façade of the building is left in a safe condition and fully enclosed; and

- 7.3. There is compliance with Section 3307.2.1.

**3307.6.3 Area to be protected.** The decking of the sidewalk shed shall extend the full length of the area that falls within the zone specified in Section 3307.6.2, plus an additional 5 feet (1524 mm) beyond such length, or to within 18 inches (457 mm) of curb line, whichever is less. The decking of the sidewalk shed shall also extend the full width of the sidewalk, walkway, or pathway that remains open to the public, except for a clearance to avoid existing obstructions, not to exceed 18 inches (457 mm) along the curb and not to exceed 1 inch (25 mm) along the face of the building or structure.

**Exceptions:**

1. Where the sidewalk shed is installed to protect against an unenclosed façade, work, or equipment that is greater than 100 feet (30 480 mm) above the ground, the shed shall protect the full length of the area specified in Section 3307.6.2 plus an additional 20 feet (6096 mm) on both sides beyond such length, or to the curb line, whichever is less.
2. Openings in the deck to avoid tree trunks and branches, provided such opening is brought as close to the tree as practical without damaging the tree.

**3307.6.4 Design and construction of sidewalk sheds.** Sidewalk sheds shall be designed and constructed in accordance with the requirements of Section 3307.6.4.1 through Section 3307.6.4.11.

**3307.6.4.1 Designer.** All sidewalk sheds shall be designed by a registered design professional.

**Exception:** Sidewalk sheds that conform to a design approved by the commissioner or the Board of Standards and Appeals, provided the shed is installed at the site in accordance with the standard design.

**3307.6.4.2 Design loads.** All sidewalk sheds shall be designed as a heavy duty sidewalk shed to carry a live load of at least 300 pounds per square foot (1464.6 kg/m<sup>2</sup>). However, where the shed is installed to protect from work performed at a height of less than 100 feet (30 480 mm) above the ground, the sidewalk shed may be designed as a light duty sidewalk shed to carry a live load of at least 150 pounds per square foot (732.3 kg/m<sup>2</sup>), provided that no item is stored or placed upon the shed.

**3307.6.4.2.1 Wind and other loads.** The effect of wind and other loads on the sidewalk shed, and any item placed or attached on or to the shed, shall be considered in the design in accordance with Chapter 16.

**3307.6.4.2.2 Storage.** Storage on sidewalk sheds shall be as follows:

1. No item shall be stored or placed upon a sidewalk shed designed as a light duty sidewalk shed under Section 3307.6.4.2.
2. No material shall be stored or placed upon a sidewalk shed designed as a heavy duty sidewalk shed under Section 3307.6.4.2 unless the shed is designed for such storage, with such areas of storage or placement clearly designated on the drawings. Where an item is to be stored or placed upon a heavy duty sidewalk shed, and such storage or placement is not in excess of 150 pounds per square foot (732.3 kg/m<sup>2</sup>) on any square foot area of the sidewalk shed, the design live load of 300 pounds per square foot (1464.6 kg/m<sup>2</sup>) need not be increased. Where an item is to be stored or placed upon a heavy duty sidewalk shed, and such storage or placement is in excess of 150 pounds per square foot (732.3 kg/m<sup>2</sup>) on any square foot area of the sidewalk shed, such shed shall be designed to carry:
  - 2.1. The live load of 300 pounds per square foot (1464.6 kg/m<sup>2</sup>) required of a heavy duty sidewalk shed; and
  - 2.2. The load of the item to be placed or stored upon the shed, minus 150 pounds per square foot (732.3 kg/m<sup>2</sup>).

**3307.6.4.3 Materials.** Sidewalk sheds shall be constructed out of wood, steel, or other material possessing equivalent strength and suitability.

**3307.6.4.4 Vertical members and beams.** Vertical members and beams of the sidewalk shed shall conform with the following:

1. Vertical members and beams shall be adequately braced and connected to prevent displacement or distortion of the framework.
2. The vertical members of the sidewalk shed shall be plumb, with a tolerance of L/100, with "L" measured as the distance from the ground to the first X-brace or bottom of the beam.
3. Vertical members shall not be placed into the street unless approved by the Department of Transportation and protected in accordance with Department of Transportation requirements.
4. Vertical members placed on the sidewalk shall not be placed closer than 18 inches (455 mm) from the face of the curbline.
5. Vertical members shall be placed at least 7 feet (2134 mm) from the edge of a curb cut or vehicular access point, or where placed closer, the vertical members nearest the curb cut or vehicular access point shall be protected against displacement by vehicles, or shall be identified with high visibility marking.

**3307.6.4.5 Deck.** The deck of the sidewalk shed shall consist of 2-inch (51 mm) thick wood plank or equivalent material and shall be capable of sustaining the loads required by Section 3307.6.4.2. The deck shall be solid, or shall consist of planking laid close and made tight. Where the edge of the sidewalk shed abuts a building or structure, the decking shall be brought tight to the face of the building or structure.

**Exception:** Where it is not possible to bring the deck tightly against the face of the building or structure, the deck shall be brought to within 1 inch (25 mm) of the face of the building or structure, with the resulting gap sealed or covered by material of sufficient manner and strength capable of trapping falling debris.

**3307.6.4.6 Parapet.** A vertical parapet at least 3 feet 6 inches (1067 mm) high, as measured from the deck of the sidewalk shed, shall be constructed along all edges of the sidewalk shed. Such parapet shall consist of solid plywood, corrugated metal, a galvanized wire screen consisting of not less than No. 16 steel wire gage with a  $\frac{1}{2}$  inch (13 mm) debris mesh, or other equivalent material, and shall be securely attached to the shed with braced uprights. Temporary removal of a portion of the parapet is permitted for the handling of material, provided the parapet is immediately restored at the end of the handling operation.

**Exceptions:**

1. A parapet is not required along the edge of the sidewalk shed that abuts a building or structure.
2. A parapet is not required along the edge of a sidewalk shed that abuts an area that is closed to the public.
3. In lieu of a vertical parapet, angled protection of identical construction to a parapet that inclines outward at an angle of 45 degrees (0.79 rad) may be utilized provided such protection is securely attached to the deck, and provided the angled protection extends to a point that intersects a line drawn 3 feet 6 inches (1067 mm) above the level of the deck.

**3307.6.4.7 Height.** The passageway under the shed shall have a minimum clear ceiling height of 8 feet (2438 mm).

**Exception:** Lights that extend no more than 8 inches (203 mm) below the level of the deck shall be excluded from the clear ceiling height measurement.

**3307.6.4.8 Lighting.** Sidewalk shed lighting shall be in conformance with the following:

1. The underside of sidewalk sheds shall be illuminated at all times either by daylight or electric light. The level of illumination shall be uniformly distributed along the entire length of the shed with a minimum of 1 foot-candle (11 lux) measured at the level of the walking surface with a minimum luminous efficacy of 45 lumens per

watt or greater and be rated to operate at temperatures of 5°F (-15°C) and higher.

2. All lamps shall be enclosed in water-resistant and vandal-resistant fixtures, and all lamps, wiring, and accessory components shall conform to the requirements of the *New York City Electrical Code*.
3. Photosensors may be used to control electric lighting according to the amount of daylight available. All photosensors shall be equipped for fail-safe operation ensuring that if the sensor or control fails, the lamps will provide the lighting levels required by this section.

**3307.6.4.9 Avoid interference.** Sidewalk sheds shall be installed and located so to not unreasonably obstruct, either visually or physically, traffic, curb cuts, vehicular access points, street lighting poles, traffic lights or signs, fire hydrants, fire department connections, water sampling stations, bus shelters, or other street furniture, trees, adjacent show windows, or means of ingress/egress.

**3307.6.4.10 Founding.** The surface upon which the shed rests shall be capable of supporting the design loads of the sidewalk shed, including any item placed or stored upon the shed.

**3307.6.4.11 Color.** Sidewalk sheds erected on or after July 1, 2013, shall be painted the color of hunter green.

**3307.6.5 Installation, adjustment, maintenance, repair, use, inspection, and removal of sidewalk sheds.** Sidewalk sheds shall be installed, adjusted, maintained, repaired, used, inspected, and removed in accordance with the following requirements.

**3307.6.5.1 Safe condition.** Sidewalk sheds shall be maintained in a safe condition and used in a manner that eliminates hazards to the public. Any hazardous conditions or defects discovered with the sidewalk shed shall immediately be brought to the attention of the permit holder for the shed.

**3307.6.5.2 Supervision of installation, adjustment, repair, and removal.** The installation, adjustment, repair, or removal of a sidewalk shed shall be performed under the supervision of a competent person designated by the permit holder for the sidewalk shed.

**3307.6.5.3 Responsibility for maintenance and use.** Sidewalk sheds shall be maintained and used by the general contractor, or where there is no general contractor, the contractor causing the work to be performed, or where there is no active work, the building owner.

**3307.6.5.4 Storage or placement of items.** No item shall be stored or placed upon a sidewalk shed unless such shed has been designed for such storage or placement in accordance with Section 3307.6.4.2.2. Where such shed has been so designed items shall be stored or placed only in the area designated on the drawings for storage. Any item placed or stored upon a sidewalk shed shall be secured in a manner to prevent dislodge-



ment, displacement by wind, and shall be distributed so as not to exceed the design limits of the sidewalk shed.

**3307.6.5.5 Cleaning.** The decks of sidewalk sheds shall be broom swept and cleaned of material daily while active work is occurring at the site.

**3307.6.5.6 Sharp edges.** Where located in an area that could pose a danger to the public, bolts and screws without a cap, and sharp edges, shall be protected to prevent injury to the public.

**3307.6.5.7 Installation inspection.** Upon completion of the installation of a sidewalk shed, the shed shall be inspected by a qualified person designated by the designer, the permit holder for the shed, or a third party acceptable to both the designer and the permit holder to verify that the sidewalk shed is in a safe condition and has been installed in accordance with drawings and the requirements of this chapter. Following the inspection, the qualified person who inspected the sidewalk shed shall prepare, sign, and date an installation inspection report. A new installation inspection report shall be prepared each time the sidewalk shed is reinstalled at the site.

**3307.6.5.8 Periodic inspection.** Six months following the initial installation inspection, and every six months thereafter, the sidewalk shed shall be inspected by a qualified person designated by the designer, the permit holder for the shed, or a third party acceptable to both the designer and the permit holder to verify that the sidewalk shed is in a safe condition and is in compliance with drawings and the requirements of this chapter. Following the inspection, the qualified person who inspected the sidewalk shed shall prepare, sign, and date an inspection report.

**3307.6.5.9 Inspection following an adjustment or repair.** Following a repair or adjustment at a site, the sidewalk shed shall be inspected by a qualified person designated by the designer, the permit holder for the shed, or a third party acceptable to both the designer and the permit holder to verify the adequacy of the repair or adjustment. The results of the inspection shall be recorded, signed, and dated by the person who performed the inspection.

**3307.6.5.10 Daily inspection.** Sidewalk sheds shall be visually inspected daily by a person designated by the general contractor, or where there is no general contractor, the contractor causing the work to be performed, or where there is no active work, by the building owner to verify:

1. The lights are functioning;
2. No brace or rail is hanging unattached at one or more ends;
3. No portions of the support structure are disconnected;
4. No section of parapet is missing; and
5. All legs remain on their support and are supported to the ground.

**Exception:** The inspections for a scaffold suspended or supported above a sidewalk shed shall be in accordance with Section 3314.

**3307.6.5.10.1 Daily inspection report.** A written record of such inspections shall be maintained by the contractor or owner, with such record signed and dated by the person who performed the inspection. Defects discovered as a result of the inspection shall immediately be brought to the attention of the permit holder for the shed.

**3307.6.5.11 Notification of removal.** The permit holder for the shed shall notify the department no more than two business days following the complete removal of a sidewalk shed.

**3307.7 Fences.** All sites where a new building is being constructed, or a building is being demolished to grade, shall be enclosed with a fence. Fences shall also be installed to fully or partially enclosed sites, as necessary, where there exists an open excavation, an unenclosed portion of a building accessible at grade, or other hazard to the public. Such fences shall be at least 8 feet (2438 mm) high, built solid for their entire length, out of wood or other suitable material, and shall be returned at the ends to the extent necessary to effectively close off the site.

**Exceptions:** The commissioner may approve the use of a chain link fence to:

1. Secure a site where work has been interrupted or abandoned and discontinued, and a registered design professional has certified that all construction or demolition equipment and material that pose a hazard to the safety of the public and property have been removed from the site or safely secured. Prior to the resumption of work, the chain link fence shall be replaced by a solid fence meeting the requirements of this section.
2. Secure portions of a site where a one-, two-, or three-family building, or a commercial building 40 feet (12 192 mm) or less in height, is being constructed or demolished and such building is setback at least 15 feet (4572 mm) from sidewalks or spaces accessible to the public and 5 feet (1524 mm) from adjoining buildings or structures.

**3307.7.1 Location of fence.** Where the fence is installed to fully enclose a site, the fence shall be constructed along the inside edge of the sidewalk or walkway and along the edges of the property line. Where a fence is installed to partially enclose a site, the fence shall be installed as necessary to prevent public access to any excavation or unenclosed portion of the building accessible at grade. Fences shall be installed and located so to not unreasonably obstruct, either visually or physically, traffic, curb cuts, vehicular access points, street lighting poles, traffic lights or signs, fire hydrants, fire department connections, water sampling stations, bus shelters, or other street furniture, trees, or means of ingress/egress.



**Exceptions:**

1. Fences may encroach onto the sidewalk in accordance with Department of Transportation requirements.
2. A fence is not required to be installed along the party wall of an adjoining property, provided no material is stored along such wall during the course of work.

**3307.7.2 Gates.** Gates shall be sliding or shall swing into areas not accessible to the public, and shall be provided only where required for access to the site or to facilitate the work. Gates shall consist of the same material and construction as the rest of the fence. Gates shall be kept closed at all times except during actual loading and unloading operations, when individuals or vehicles are actively entering or leaving the site, or as needed to facilitate active work around the gate.

**Exception:** Where approved by the commissioner, chain link gates may be utilized in a solid fence.

**3307.7.3 Viewing panels.** Viewing panels shall be provided in solid fences erected on or after July 1, 2013, at a rate one for every 25 linear feet (7.6 m) per frontage, with a minimum of one per frontage. Viewing panels shall be 12 inches by 12 inches± (305 by± 305 mm) in size and shall be blocked with plexiglass or an equivalent nonfrangible material. The top of the viewing panel shall be located no more than 6 feet (1829 mm) above the level of the ground, and the bottom of the viewing panel shall be located no less than 3 feet (914 mm) above the level of the ground.

**3307.7.4 Chain link fences or gates.** Where a chain link fence or gate is utilized, the following requirements shall apply:

1. The fence or gate shall be made of new materials or, where salvaged, the fence shall be in good condition;
2. The fence posts shall be of galvanized steel pipe of a diameter that provides rigidity. Posts shall be suitable for setting in concrete footings, for driving into the ground, or for inserting in precast concrete blocks. Such posts shall be spaced in a manner that maintains the required rigidity to form a safe exterior fence;
3. The fence or gate shall be constructed of woven, galvanized steel wire mesh and shall be of sufficient strength and rigidity to prevent access to the site; and
4. The fence or gate shall be covered with an opaque sturdy cloth "windscreen" fabric at all locations. Fabric shall be securely attached to the fence or gate in accordance with manufacturer specifications. The fabric and fence shall be maintained in a neat, rigid and taut appearance.

**3307.7.5 Design of fences.** Fence installations shall be designed by a registered design professional. The effect of

wind on the fence shall be considered in the design in accordance with Chapter 16.

**Exceptions:**

1. Fences installed in connection with the construction or demolition of a one-, two-, or three-family building.
2. Fences that conform to a standard design approved by the commissioner provided the fence is installed at the site in accordance with the standard design.

**3307.7.6 Installation and removal of fences.** Fences required by this section shall be installed prior to the commencement of work. Such required fences shall not be removed until:

1. The site has been filled and graded and all hazards to the public removed; or
2. The façade has been enclosed, with all doors and windows installed, and all exterior work, except for incidental work including but not limited to landscaping, painting, weatherproofing, or installation of signs or fixtures, has been completed.

**3307.7.7 Condition of fences.** All fences shall be installed, adjusted, repaired, and maintained in a sound condition, free of protruding or loose nails, wood, or metal, and with posts in an upright position restrained to prevent the fence from leaning or overturning.

**3307.7.8 Color.** Fences erected on or after July 1, 2013, shall be painted hunter green.

**3307.8 Maintaining Department of Transportation pedestrian protection in place.** Notwithstanding other provisions of law, pedestrian protection required by the Department of Transportation shall be maintained in place and kept in good order for the entire length of time pedestrians may be endangered.

**3307.9 Removing protection at conclusion of work.** Public property shall be left in as good a condition following the completion of the construction or demolition work as it was before such work was commenced. Except where otherwise required by this code, the owner or the owner's agent shall, upon the completion of the construction or demolition work, immediately remove all sidewalk sheds, fences, guard rails, temporary walkways, material, and other obstructions in or adjacent to the public way.

**3307.10 Facilitating city work.** In the event a duly authorized city agency must repair, maintain, or install city property, including but not limited to intersection control signs, electrical equipment, traffic signals, lane markings, bus shelters, street lighting, other street furniture, or fire hydrants, at a location where pedestrian protection required by this chapter is located; such pedestrian protection shall be removed as directed by the department of buildings as long as the removal is deemed to be safe and, if necessary, suitable appropriate pedestrian protection that does not interfere with the work of such city agency is installed.

## SECTION BC 3308 PROTECTION OF UNENCLOSED PERIMETERS

**3308.1 Scope.** Safety netting systems and guardrail systems shall be provided as required by this section to protect unenclosed perimeters. Except where this section authorizes the temporary removal of unenclosed perimeter protection, no work shall occur, nor shall materials be stored on any level where required unenclosed perimeter protection is not installed.

**3308.2 Permit.** A permit is not required for the installation of safety netting systems and guardrail systems that are in accordance with this section. A permit is required for alternative methods granted under Section 3308.8, including but not limited to cocoon systems, climbing formwork, and enclosure panels.

**3308.3 Safety netting design and documentation.** Safety netting shall be designed and provided with documentation in accordance with Sections 3308.3.1 through 3308.3.5.

**3308.3.1 Design.** Safety netting systems shall be designed by a registered design professional to meet temporary loads, including but not limited to wind, as prescribed in Chapter 16. The registered design professional shall take the supporting structure into account when designing the installation and shall include details of connections, anchorages, and supports. The minimum loads for vertical net cables required by Section 3308.5.3 need not be added to wind loads in determining the maximum lateral force, but in no event shall the maximum design load for the cables be less than that required by Section 3308.5.3. A reduction in the surface area due to the openings in vertical or horizontal net fabric or partially enclosed perimeter panel is permitted provided that the force at design wind speed is derived from manufacturers' test data or other testing or methods acceptable to the commissioner.

**3308.3.2 Site safety plans.** Details of the safety netting system shall also be shown on the site safety plan, where such plan is required by Section 3310.

**3308.3.3 Make and model.** The make and model of vertical and horizontal netting, along with the connections and supports, shall be acceptable to the registered design professional responsible for the design of the safety netting systems in accordance with Section 3308.3.1. The make and model, along with acceptance of the make and model by such registered design professional, shall be indicated as a note on the drawings, or in the form of a signed, sealed, and dated letter from such registered design professional that is kept with the drawings.

**3308.3.4 Flame retardant.** Vertical and horizontal safety netting shall be flame retardant in accordance with NFPA 701. Documentation of such shall be provided by the manufacturer and shall be noted on the drawings by the registered design professional responsible for the design of the safety netting systems in accordance with Section 3308.3.1, or shall be recorded by such registered design professional in the form of a signed, sealed, and dated letter from such registered design professional, with such letter kept with the drawings.

**3308.3.5 Tensile strength.** The tensile strength for the structural net utilized in connection with the horizontal safety netting system shall be noted on the drawings by the registered design professional responsible for the design of the safety netting systems in accordance with Section 3308.3.1, or shall be recorded by such registered design professional in the form of a signed, sealed, and dated letter from such registered design professional, with such letter kept with the drawings. Where required by Section 3308.6.3, the strength shall be confirmed by testing; the results of the test shall be documented in the form of a signed, sealed, and dated letter from the registered design professional responsible for the design of the safety netting systems in accordance with Section 3308.3.1. Such letter shall be kept with the drawings.

**3308.4 Responsibility and supervision.** The permit holder for the project, or where a permit is required by Section 3308.2, the permit holder of such, shall be responsible for complying with the requirements of Section 3308. A competent person designated by such responsible permit holder shall supervise the installation, inspection, adjustment, maintenance, repair, and removal of all safety netting systems and guardrail systems, along with any support, connection, or component, or alternative methods granted under Section 3308.8.

**Exception:** Where this section requires another entity to perform an inspection.

**3308.5 Vertical safety netting systems.** Vertical safety netting shall be installed and maintained to cover all unenclosed perimeters.

### Exceptions:

1. Vertical safety netting is not required at the:
  - 1.1. Story at grade; or
  - 1.2. The working deck; or
  - 1.3. Any story in concrete construction where the formwork has not been stripped, provided such floor is no more than four stories or 40 feet (12 192 mm) below the working deck; or
  - 1.4. Any story in steel construction where the slab has not been poured.
2. Vertical safety netting is not required at a level where a supported scaffold covers the full width of the unenclosed perimeter, provided the scaffold is decked and flush against the building at such level where the unenclosed perimeter exists, with no gap between the scaffold and the building greater than 3 inches (76 mm), and also provided that the scaffold is provided with netting and guardrails in accordance with Section 3314.8.
3. Vertical safety netting is not required to protect an unenclosed window opening, provided such window opening is enclosed with a sill not less than 2 feet 6 inches (762 mm) in height and protected with vertical mullions or piers with a maximum opening of 5 feet (1524 mm) and a noncorrosive wire cable capa-

ble of withstanding a load of at least 200 pounds (890 n) applied in any direction except upward.

4. Vertical safety netting is not required for a building whose final height will be 4 stories or 40 feet (12 192 mm) or less in height.
5. Vertical safety netting is not required for a minor alteration or ordinary repair.

**3308.5.1 Openings.** The largest opening area for debris netting when used vertically shall not be larger than 1 square inch (25.4 mm<sup>2</sup>).

**3308.5.2 Height.** Where required, vertical safety netting shall extend to cover all openings in the unenclosed perimeter to a height of at least 60 inches (1524 mm) above the floor or, where installed at the roof level, the roof.

**3308.5.3 Cables.** Vertical safety netting shall be secured to noncorrosive wire cable capable of withstanding a load of at least 200 pounds (90.7kg) applied in any direction except upward. The cables shall be located at a height of 60 inches (1524 mm), 42 inches (1067 mm), 21 inches (533 mm), and 0 inches (0 mm) above the level of the floor or, where installed at the roof level, the roof. Where the vertical safety netting extends above 60 inches (1524 mm) in height, a cable shall also be placed at the top of the netting, with intermediate cables between the 60 inch (1524 mm) cable and the top cable as needed to satisfy the design requirements of Section 3308.3.

**Exceptions:** In lieu of a cable:

1. At 60 inches (1524 mm) or above, a toprail made of wood, pipe, or structural angle meeting the requirements of Section 3308.7.3.
2. At 42 inches (1067 mm) and 21 inches (533 mm), midrails made of wood, pipe, or structural angle meeting the requirements of Section 3308.7.3.
3. At 0 inches (0 mm), a toeboard meeting the requirements of Sections 3308.7.2 and 3308.7.3, provided the net is secured to the toeboard.

**3308.5.4 Taut systems.** Where the vertical safety netting relies upon a taut system, the net and cables shall be maintained taut. A positive tensioning system such as a turn-buckle shall be provided to keep the cable taut.

**3308.5.5 Friction connections.** Wood installations that utilize a friction connection are not permitted.

**3308.5.6 Temporary removal.** Vertical safety netting may be temporarily removed in the immediate area where active loading or unloading operations are occurring, or where perimeter work is occurring, provided that:

1. A controlled access zone is established to prevent unauthorized personnel from entering the area where the nets are removed; and
2. Immediately prior to the removal of the nets the floor is broom swept and cleared of all material, equipment, and debris to a distance of at least 10 feet (3048 mm), in all directions, from the area where the vertical nets will be removed.

**Exceptions:** The following material does not have to be removed to a distance of at least 10 feet (3048 mm), in all directions:

1. Material and equipment related to the loading or unloading operation or perimeter work.
2. Stored materials in accordance with Section 3303.4.5.2.

**3308.5.6.1 Restoring nets.** The vertical safety nets shall be reinstalled immediately following the end of active loading or unloading operations, or active work, or at the end of the workday, whichever occurs sooner.

**3308.5.7 Permanent removal.** Vertical safety netting systems may be removed from floors where the façade has been installed and all such openings in the façade, including for windows, have been permanently enclosed to a height of at least 60 inches (1524 mm) above the floor. Vertical safety netting systems may be removed from the roof where the final parapet or guardrail has been installed.

**3308.6 Horizontal safety netting systems.** Horizontal safety netting shall meet the requirements of Sections 3308.6.1 through 3308.6.4.

**3308.6.1 Where required.** Horizontal safety netting shall be installed and maintained as follows.

**3308.6.1.1 During construction.** When, during the course of new building construction, or during the vertical or horizontal enlargement of an existing building, the uppermost walkable floor reaches a height of six stories or 75 feet (22 860 mm) above the level of the ground or an adjoining roof, horizontal safety netting shall be provided at a level not more than two stories or 30 feet (9144 mm) below:

1. In concrete structures: the stripping floor; or
2. In steel structures: at the uppermost story where the concrete floor slab has been poured.

**Exception:** When tarpaulins encase one or more floors immediately below the finished concrete floor in order to maintain temporary heat, the horizontal netting may be located no more than three floors below the finished concrete floor.

**3308.6.1.2 During demolition.** When the demolition of the exterior walls or the roof of a building occurs at a height greater than 6 stories or 75 feet (22 860 mm), horizontal safety netting shall be provided at a level not more than two stories or 30 feet (9144 mm) below the story from which the exterior walls and roof are being removed.

**Exception:** Demolition of exterior walls only for the purposes of the alteration, maintenance, or repair of a façade shall be in accordance with Section 3308.6.1.3.

**3308.6.1.3 During façade construction, alteration, maintenance, or repair.** Where unique hazards associated with the construction, alteration, maintenance, or repair of a façade exist to the public and property, hori-



zontal safety netting shall be provided as required by the commissioner.

**3308.6.1.4 Supported scaffold alternative.** In lieu of horizontal safety netting in accordance with Sections 3308.6.1.1 through 3308.6.1.3, a supported scaffold may be utilized provided such supported scaffold covers the full width of the unenclosed perimeter, the scaffold is decked and flush against the building at the level where work is occurring, with no gap between the scaffold and the building greater than 3 inches (76 mm), and also provided that the scaffold is provided with netting and guardrails in accordance with Section 3314.8.

**3308.6.1.5 Hoisting area.** Where approved by the commissioner, horizontal safety netting may be omitted in designated crane, derrick, or hoisting areas.

**3308.6.1.6 Temporary removal.** Horizontal safety netting may be temporarily removed in the immediate area where active loading or unloading operations are occurring, or where perimeter work is occurring, or to relocate the nets to a higher level, provided that no concrete work, including formwork placement or stripping, no structural steel placement or assembly, and no work within 10 feet (3048 mm) from an unenclosed perimeter of the building occurs on levels above the horizontal safety netting. Horizontal safety nets shall be reinstalled immediately following the end of active loading or unloading operations, or active work, or at the end of the workday, whichever occurs sooner.

**3308.6.1.7 Permanent removal.** Horizontal safety netting systems may be permanently removed as follows:

1. Horizontal safety netting systems installed for the construction of a building in accordance with Section 3308.6.1.1 may be removed after all concrete has been poured at the highest level and all concrete stripping work at the highest level has been completed.
2. Horizontal safety netting systems installed for the demolition of a building in accordance with Section 3308.6.1.2 may be removed after the demolition has progressed to within six stories or 75 feet (22 860 mm) above the ground or adjoining roof level.
3. Horizontal safety netting systems installed for façade work in accordance with Section 3308.6.1.3 may be removed after all façade work above the level of the nets has been completed.

**3308.6.2 Horizontal safety netting systems requirements.** Horizontal safety netting systems shall meet the requirements of Sections 5, 6.3, 6.4, 6.5, 6.6, 7, 8, 10.1, 10.4, 10.5, 10.6, 10.7, 11, and 13 of ANSI/ASSE A10.11, as modified as follows.

**3308.6.2.1 Personnel net.** Throughout the standard, the term “personnel net” shall be amended to read “structural net.”

**3308.6.2.2 Should and shall.** Throughout the standard, the term “should” shall be amended to read “shall.”

**3308.6.2.3 Entanglement.** The phrase, “and to minimize entanglement of the persons head, arms, and legs when arresting the fall,” shall be deleted from Section 6.3 of ANSI/ASSE A10.11.

**3308.6.2.4 Arresting a fall.** The phrase “when arresting a fall,” shall be deleted from Section 6.4 of ANSI/ASSE A10.11.

**3308.6.2.5 Size of debris net openings.** Section 6.6 of ANSI/ASSE A10.11 shall be amended by adding a new sentence at the end of the section, as follows, “However, in no case shall the largest opening area for debris netting when used horizontally be larger than 1/2 square inch (12.7 mm<sup>2</sup>).”

**3308.6.2.6 Projection of nets.** The phrase, “as to capture falling personnel” in Section 10.6 of ANSI/ASSE A10.11 shall be amended to read “as to capture falling material.”

**3308.6.2.7 Supports.** The phrase, “or personnel” in Section 10.7 of ANSI/ASSE A10.11 shall be amended to read, “or material.”

**3308.6.2.8 Inspection.** Section 11.1 of ANSI/ASSE A10.11 shall be deleted in its entirety and replaced with the following, “Horizontal safety netting systems shall be inspected in accordance with Section 3308.9.3.”

**3308.6.2.9 Dates tested.** The phrase “Dates inspected” in Item 5 of Section 11.4 of ANSI/ASSE A10.11 shall be amended to read “Dates tested”.

**3308.6.2.10 Moving.** Section 11.4 of ANSI/ASSE A10.11 shall be amended to add a new Item 9, which shall read, “Dates nets were moved to a higher or lower level.”

**3308.6.2.11 Cleaning.** Section 13.2 of ANSI/ASSE A10.11 shall be deleted and replaced with the following: “Horizontal safety netting shall not be used for storing material. Horizontal netting shall be cleaned, at least daily, to remove any items that fall into the nets.”

**3308.6.3 Tensile strength test.** The tensile strength of netting mesh and/or twine of a structural net utilized in conjunction with a horizontal safety netting system shall be confirmed by testing in accordance with ASTM D 5034 or ASTM D 5035. The testing criteria shall be developed by the registered design professional who designed the safety netting system in accordance with Section 3308.3. Such testing shall occur prior to the installation of the net at the site for any net that has previously been used, and for any net that has been installed at the site for two years and every two years thereafter. Nets that do not meet the specified tensile strength as required by Section 3308.3.5 shall not be utilized or shall be replaced.

**3308.6.4 Identification of nets.** Structural netting shall be identified in accordance with Section 7 of ANSI/ASSE A10.11. Debris netting shall be identified by a letter or other documentation from the manufacturer stating the description and model. The identification for structural netting and debris netting shall be kept at the site until the netting is removed.



**3308.7 Guardrail system.** A guardrail system shall be installed and maintained to protect all unenclosed perimeters.

**Exceptions:** A guardrail system is not required at:

1. The story at grade.
2. Levels where vertical safety netting is installed in accordance with Section 3308.5.
3. Levels where a supported scaffold covers the full width of the unenclosed perimeter, provided the scaffold is decked and flush against the building at such level where the unenclosed perimeter exists, with no gap between the scaffold and the building greater than 3 inches (76 mm), and also provided that the scaffold is provided with netting and guardrails in accordance with Section 3314.8.

**3308.7.1 Components.** Guardrail systems shall include a top rail, midrail, toeboard, and posts.

**3308.7.2 Height of railings and toeboard.** Toprails, midrails, and toeboards shall be located as follows:

1. The top of the top rail shall be located at a height of 39 to 45 inches (991 and 1143 mm) above the floor.
2. The midrail shall be located at a height approximately midway between the top rail and the floor, or where more than one midrail is utilized, each shall be located equidistant from each other, the floor, and the top rail.
3. The toeboard shall be at least 3½ inches (89 mm) high and shall be installed so that there is not more than a ¼ inch (6 mm) gap between the floor and the bottom of the toeboard.

**Exception:** When conditions warrant, the height of the top rail may exceed the 45-inch (1143 mm) height provided additional midrails are installed so that there is no vertical gap larger than 24 inches (610 mm) between any toeboard, midrail, or top rail.

**3308.7.3 Dimensions and materials.** Toprails, midrails, toeboards, and posts shall have the following dimensions and be constructed out of the following materials:

1. Toprails shall, at a minimum, consist of:
  - 1.2. 2 inch by 4 inch (51 mm by 102 mm) 1500 foot pounds per square inch† (1.05 kgf/mm²) fiber (stress grade) construction grade lumber;
  - 1.2. 1½ inch (38 mm) nominal diameter (Schedule 40) pipe;
  - 1.3. 2 inch by 2 inch by ¾ inch (51 mm by 51 mm by 10 mm)† structural angle; or
  - 1.4. ¼ inch (6 mm) diameter noncorrosive wire cable made of mild plow steel.
2. Midrails shall, at a minimum, consist of:
  - 2.1. 1 inch by 6 inch (25 mm by 152 mm) 1500 foot pounds per square inch† (1.2.1.05 kgf/mm²) fiber (stress grade) construction grade lumber;

2.2. 1½ inch (38 mm) nominal diameter (schedule 40) pipe;

2.3. 2 inch by 2 inch by ¾ inch (51 mm by 51 mm by 10 mm)† structural angle; or

2.4. ¼ inch (6 mm) diameter noncorrosive wire cable made of mild plow steel.

3. Toeboards shall, at a minimum, consist of:

3.1. 1 inch by 6 inch (25 mm by 152 mm) lumber; or

3.2. Metal plank at least 3½ inches (89 mm) high.

4. Toprails, midrails, and toeboards shall be securely fastened to upright posts spaced not more than 8 feet (2438 mm) apart. Such posts shall, at a minimum, consist of:

4.1. 2 inch by 4 inch (51 mm by 102 mm) 1500 foot pounds per square inch† (1.05 kgf/mm²) fiber (stress grade) construction grade lumber;

4.2. 1½ inch (38 mm) nominal diameter (schedule 40) pipe;

4.3. 2 inch by 2 inch by ¾ inch (51 mm by 51 mm by 10 mm)† structural angle; or

4.4. A building column.

**Exceptions:**

1. Guardrail systems designed by a registered design professional capable of withstanding, without failure:

1.1. A force of at least 200 pounds (890 n) applied within 2 inches (51 mm) of the top edge, in any outward or downward direction, at any point along the top edge. Where the force is applied in a downward direction, the top edge shall not deflect more than 6 inches (152 mm) and in no case to a height less than 39 inches (991 mm) above the floor; and

1.2. A load of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard.

2. Posts supporting wire cable top rails and midrails, as well as the toeboards utilized in connection with such wire cable top rails and midrails, may be spaced more than 8 feet (2438 mm) apart provided that the posts are spaced such that where a force of 200 pounds (890 n) is applied in a downward direction along the top edge, the top edge shall not deflect more than 6 inches (152 mm) and in no case to a height less than 39 inches (991 mm) above the floor.

**3308.7.4 Horizontal gap.** The guardrail system shall be installed so that there exists no horizontal gap larger than 1 inch (25 mm) as measured along the perimeter of the building from the edge of the guardrail system to any building column or façade.

**3308.7.5 Tensioning system.** When made of wire cable, top rails and midrails shall be provided with a positive ten-

sioning system, such as a turnbuckle, to keep the cable taut.

**3308.7.6 Dislodgement.** Guardrail systems shall be secured to prevent dislodgement by impact or wind.

**3308.7.7 Temporary removal.** Guardrail systems may be temporarily removed in the immediate area where active loading or unloading operations are occurring, or where perimeter work is occurring, provided that:

1. A controlled access zone is established to prevent unauthorized personnel from entering the area where the guardrail system is removed; and
2. Immediately prior to the removal of the guardrail system the floor is broom swept and cleared of all materials and equipment to a distance of at least 10 feet (3048 mm), in all directions, from the area where the guardrail system will be removed, except for material and equipment related to the loading or unloading operation or perimeter work or stored in accordance with Section 3303.4.5.2.

**3308.7.7.1 Restoring guardrails.** The guardrail system shall be reinstalled immediately following the end of active loading or unloading operations, or active work, or at the end of the workday, whichever occurs sooner.

**Exception:** Where material overhangs overnight in accordance with Section 3303.4.5.2.

**3308.7.8 Permanent removal.** Guardrail systems installed to protect unenclosed perimeters may be removed where vertical safety netting systems meeting the requirements of Section 3308.5 have been installed.

**3308.8 Modifications and alternative systems.** The commissioner may, based upon a written request from a registered design professional, modify the requirements for safety netting systems and guardrail systems required by this section, including but not limited to the installation of alternative systems, provided such modification or alternative system meets or exceeds the level of safety afforded to the public and property by safety netting systems and guardrail systems installed in accordance with this section.

**3308.8.1 Request content.** A request submitted under Section 3308.8 shall include:

1. Details of the modification or alternative system to be utilized;
2. Any stipulations;
3. Demonstration that the request meets or exceeds the level of safety afforded to the public and property by safety netting systems and guardrail systems installed in accordance with this section;
4. Where applicable, a description of the practical difficulty of complying with code requirements;
5. Where applicable, a reference to the site safety monitoring program; and
6. Where an alternative system is proposed, a minimum level of inspection in accordance with the rec-

ommendations of the manufacturer of the alternative system.

**3308.9 Unenclosed perimeter protection inspection, use, adjustment, maintenance, and repair.** Safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 shall be inspected, used, adjusted, maintained, repaired, and replaced in accordance with the design drawings, manufacturer recommendations, and the requirements of this code.

**3308.9.1 Safe condition.** Safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 shall be maintained in a safe condition and used in a manner that eliminates hazards to the public and property. Any hazardous conditions or defects discovered with such shall immediately be brought to the attention of the responsible permit holder under Section 3308.4.

**3308.9.2 Precautions.** Precautions shall be taken to prevent safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 from being damaged by sunlight, abrasion, sand, rust, welding, cutting operations, chemicals, and airborne contaminants, where such systems are susceptible to damage by such.

**3308.9.3 Inspections.** Safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 shall be inspected for compliance with this code and required drawings daily, as well as after each impact loading event, installation, reinstallation, adjustment, maintenance, or repair of such, or any part or component of such. Where the job requires a site safety manager or coordinator in accordance with Section 3310, the inspection shall be performed by the site safety manager or coordinator, and a written record of such inspection maintained as part of the site safety log. Where the job does not require a site safety manager or coordinator, the inspection shall be performed by a competent person designated by the permit holder in accordance with Section 3308.4, with a record of such inspection prepared, initialed, and dated by such competent person.

**3308.9.4 Removing from service.** Safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 showing signs of mildew, corrosion, wear, tears, breaks, frays, damage, or deterioration that may substantially affect the strength of such shall be immediately removed from service.

**3308.9.5 Repair.** Repairs to safety net systems, guardrail systems, and alternative systems authorized under Section 3308.8 shall be in accordance with the specifications of the manufacturer of such and shall provide the original manufacturer factor of safety, or where none exists, shall be repaired in accordance with specifications developed by the registered design professional responsible for the design of the safety netting systems in accordance with Section 3308.3.1.

**Exception:** Structural nets and debris nets shall not be repaired.

## SECTION BC 3309 PROTECTION OF ADJOINING PROPERTY

**3309.1 Protection required.** Adjoining public and private property, including persons thereon, shall be protected from damage and injury during construction or demolition work in accordance with the requirements of this section. Protection must be provided for footings, foundations, party walls, chimneys, skylights and roofs. Provisions shall be made to control water run-off and erosion during construction or demolition activities.

**3309.1.1 Notification.** Where a construction or demolition project will require access to adjoining property in accordance with this section, written notification shall be provided to the adjoining property owner at least 60 calendar days prior to the commencement of work. Such notification shall describe the nature of work, estimated schedule and duration, details of inspections or monitoring to be performed on the adjoining property, protection to be installed on the adjoining property, and contact information for the project. Where no response is received, a second written notification shall be made no more than 45 calendar days, and not less than 30 calendar days, prior to the commencement of work.

**3309.2 License to enter adjoining property.** The responsibility of affording any license to enter adjoining property shall rest upon the owner of the adjoining property involved; and in case any tenant of such owner fails or refuses to permit the owner to afford such license, such failure or refusal shall be a cause for the owner to dispossess such tenant through appropriate legal proceedings for recovering possession of real property. Nothing in this chapter shall be construed to prohibit the owner of the property undertaking construction or demolition work from petitioning for a special proceeding pursuant to Section 881 of the *Real Property Actions and Proceedings Law*.

**3309.3 Physical examination.** When permission to enter upon adjoining property has been obtained, a physical examination of such property shall be conducted by the person causing the construction or demolition operations prior to the commencement of the operations and at reasonable periods during the progress of the work. Observed conditions shall be recorded by the person causing the construction or demolition operations, and such records shall be made available to the department upon request.

**3309.4 Soil or foundation work affecting adjoining property.** Whenever soil or foundation work occurs, regardless of the depth of such, the person who causes such to be made shall, at all times during the course of such work and at his or her own expense, preserve and protect from damage any adjoining structures, including but not limited to footings and foundations, provided such person is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining buildings and property, and to perform such work thereon as may be necessary for such purpose. If the person who causes the soil or foundation work is not afforded a license, such duty to preserve and protect the adjacent property shall devolve to the owner of such adjoining property, who shall be afforded a similar license with

respect to the property where the soil or foundation work is to be made.

**3309.4.1 Additional safeguards during excavation.** The following additional requirements shall apply during excavation:

1. The person causing the excavation shall support the vertical and lateral load of the adjoining structure by proper foundations, underpinning, or other equivalent means where the level of the foundations of the adjoining structure is at or above the level of the bottom of the new excavation.
2. Where the existing adjoining structure is below the level of the construction or demolition, provision shall be made to support any increased vertical or lateral load on the existing adjoining structure caused by the construction or demolition.
3. Where the construction or demolition will result in a decrease in the frost protection for an existing foundation below the minimums established in Section 1805.3.1, the existing foundation shall be modified as necessary to restore the required frost protection.

**3309.4.2 Support of party walls.** Where a party wall will be affected by excavation, regardless of the depth, the person who causes the excavation to be made shall preserve such party wall at his or her own expense so that it shall be, and shall remain, in a safe condition. Where an adjoining party wall is intended to be used by the person causing an excavation to be made, and such party wall is in good condition and sufficient for the uses of the existing and proposed buildings, it shall be the duty of such person to protect such party wall and support it by proper foundations, so that it shall be and remain practically as safe as it was before the excavation was commenced.

**3309.4.3 Preconstruction survey.** No excavation work to a depth of 5 feet to 10 feet (1524 mm to 3048 mm) within 10 feet (3048 mm) of an adjacent building, or an excavation over 10 feet (3048 mm) anywhere on the site shall commence until the person causing an excavation to be made has documented the existing conditions of all adjacent buildings in a preconstruction survey.

**3309.4.4 Monitoring.** During the course of excavation work the following shall be monitored in accordance with Section 3309.16:

1. Buildings that are within a distance from the edge of the excavation that is equal to or less than the maximum depth of the excavation.
2. Historic structures that are contiguous to or within a lateral distance of 90 feet (27 432 mm) from the edge of the lot where an excavation is occurring.

**Exception:** Monitoring is not required for excavations to a depth of five feet (1523 mm) or less, provided:

1. The excavation occurs more than 5 feet (1524 mm) from all footings and foundations; or
2. Where the excavation occurs within five feet (1524 mm) or less from a footing or foundation,



such excavation does not occur below the level of the footing or foundation.

**3309.4.5 Potential hazard.** When, in the opinion of the commissioner, a potential hazard exists as a result of soil or foundation work, elevations of the adjacent buildings shall be recorded or other monitoring procedures shall be implemented by a registered design professional at intervals of 24 hours or less as determined by the commissioner to ascertain if movement has occurred.

**3309.5 Underpinning.** Whenever underpinning is required to preserve and protect an adjacent property from construction, demolition, or excavation work, the person who causes such work shall, at his or her own expense, underpin the adjacent building provided such person is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining buildings and property, and to perform such work thereon as may be necessary for such purpose. If the person who causes the construction, demolition, or excavation work is not afforded a license, such duty to preserve and protect the adjacent property shall devolve to the owner of the adjoining property, who shall be afforded a similar license with respect to the property where the construction, demolition, or excavation is to be performed.

**3309.6 Subsurface operations affecting adjacent properties.** Whenever subsurface operations, other than excavation or fill, are conducted that may impose loads or movements on adjoining property, including but not limited to the driving of piles, compaction of soils, or soil solidification, the effects of such operations on adjoining property and structures shall be monitored in accordance with Section 3309.16.

**Exception:** Monitoring during underpinning shall be in accordance with Section 1814.

**3309.6.1 Change in ground water level.** Where placement of a foundation will cause changes in the ground water level under adjacent buildings, the effects of such changes on the stability and settlement of the adjacent foundations shall be investigated and provision shall be made to prevent damage to such buildings.

**3309.6.2 Potential hazard.** When, in the opinion of the commissioner, a potential hazard exists as a result of subsurface operations, elevations of the adjacent buildings shall be recorded by a registered design professional at intervals of 24 hours or less as determined by the commissioner to ascertain if movement has occurred.

**3309.7 Retaining structures.** When the regulation of a lot requires the ground on such lot to be raised or lowered and kept higher than the ground of the adjoining lot, provided the ground of such adjoining lot is not maintained at a grade lower than in conformity with the street or streets on which it is situated; or where an excavation has been made or a fill placed on any lot meeting the curb level requirements; and the adjoining land is maintained at a grade in conformity with or lower than the streets or streets on which it is situated; and is without permanent structures other than frame sheds or similar structures, a retaining structure shall be constructed for the safe support of adjoining ground, unless the

bank between the adjoining properties is maintained at a safe angle of repose. Any necessary retaining wall shall be built and maintained jointly by the owners on each side, unless otherwise agreed to by both owners.

**3309.7.1 Surplus retaining structures.** Where any owner maintains his or her ground either higher or lower than the legal regulation prescribed in the *Administrative Code*, the surplus retaining structure that may be necessary to support such height or provide for such excavation shall be made at the sole expense of such owner, and any additional thickness that may be required shall be built on the land of such owner.

**3309.7.2 Removal of retaining structures.** Any retaining structure erected as provided above, standing partly on the land of each owner, may be removed by either owner when the original reason for the erection of such retaining structure ceases to exist.

**3309.8 Adjoining walls.** When any construction or demolition operation exposes or breaches an adjoining wall, including load bearing and nonload-bearing walls as well as party walls and non party walls, the person causing the construction or demolition operation shall, at his or her own expense, perform the following:

1. Maintain the structural integrity of such walls and adjoining structure, and have a registered design professional investigate the stability and condition of the wall and adjoining structure, and take all necessary steps to protect such wall and structure.
2. Maintain all required fire exits and passageways or provide substitutions meeting the requirements of this code.
3. Cut off close to the walls all beams in party walls, remove stub ends without weakening existing masonry, clean beam pockets of loose mortar, bend over all wall anchors at the beam ends in the standing wall, and brick-up all open beam holes with sound brick and cement mortar.
4. During demolition operations, where the floor beams of the adjacent building bear on the party wall, the person causing the demolition shall ascertain that such beams are anchored into the wall and, where such anchorage is lacking, shall provide anchorage or otherwise brace the standing wall.
5. During demolition operations, all nonload-bearing chimney breasts, projections and any other debris exposed on party walls shall be examined and monitored by the person causing the demolition. Removal of such items shall be made under the supervision of a registered design professional only if the stability of the adjacent building or structure will not be affected. All openings shall be bricked up flush on the exterior side of the party wall. All masonry that is in poor condition shall be pointed and patched.

**3309.9 Weatherproof integrity of adjoining buildings.** Where the waterproof integrity of an adjoining wall or build-



ing has been impaired due to construction or demolition operations, the person causing the construction or demolition operations shall, at his or her own expense, provide all necessary measures to permanently waterproof the adjoining wall or building in order to establish or restore the weatherproof integrity of such adjoining wall or building. This shall include, but is not limited to:

1. Bending over and flashing all roofing material of adjoining buildings;
2. Sealing and permanently waterproofing all doors or other openings in party walls;
3. Properly sealing all cornices, where cut;
4. Pointing up and making waterproof any walls and parapets and any walls that have been disturbed;
5. Removing all exposed furring, lath, and plaster on party walls; and
6. Removing, replacing, and firmly anchoring any loose wall material.

**3309.10 Protection of roofs.** Whenever any building is to be constructed or demolished above the roof of an adjoining building, it shall be the duty of the person causing such work to protect from damage at all times during the course of such work and at his or her own expense the roof, skylights, other roof outlets, and equipment located on the roof of the adjoining building, and to use every reasonable means to avoid interference with the use of the adjoining building during the course of such work, provided such person causing such work is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining building and perform such work thereon as may be necessary for such purpose; otherwise, the duty of protecting the roof, skylights, other roof outlets, and equipment on the roof of the adjoining building shall devolve upon the owner of such adjoining building.

Adjoining roof protection shall be secured to prevent dislodgement by wind. Where construction or demolition work occurs at a height of at least 48 inches (1219 mm) above the level of the adjoining roof, adjoining roof protection shall consist of 2 inches (51 mm) of flame-retardant foam under 2 inches (51 mm) of flame-retardant wood plank laid tight and covered by flame-retardant plywood, or shall consist of equivalent protection acceptable to the commissioner, and shall extend to a distance of at least 20 feet (508 mm) from the edge of the building being constructed or demolished.

**3309.11 Protection of trees.** No trees outside the property line within the public right-of-way shall be disturbed or removed without the permission of the commissioner of the department of parks and recreation. Protection meeting the requirements of the department of parks and recreation shall be provided for all such trees, and written notification shall also be made to the department of parks and recreation at least 48 hours prior to commencement of such work.

**3309.11.1 Deleterious, caustic, or acid materials.** No deleterious, caustic, or acid materials shall be dumped or mixed within 10 feet (3048 mm) of any tree within the

public right-of-way, nor shall salt for the removal of ice or snow be applied when runoff will drain to a tree within the public right-of-way.

#### Exceptions:

1. Mixing, delivery, or placement of concrete from a concrete mixer or concrete truck.
2. Application of de-icing materials as necessary to prevent slipping and tripping hazards in areas accessible to the public during periods where freezing conditions are to be encountered.

**3309.12 Protection of chimneys.** Any person having the duty to alter or maintain chimneys of any adjoining building under and pursuant to the provisions of this code, the *New York City Mechanical Code*, the *New York City Fuel Gas Code*, or other applicable laws and rules shall be afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect such adjoining building and perform such work thereon as may be necessary for such purpose; otherwise, such duty shall devolve upon the owner of such adjoining building.

**3309.13 Protection of adjoining equipment and spaces.** Whenever a major building is constructed or demolished, and provided such work requires a site safety plan in accordance with Section 3310, it shall be the duty of the person causing such work to protect from damage, at all times during the course of such work and at his or her own expense, all mechanical, electrical, and similar equipment on the adjoining property that are within 20 feet (508 mm) from an unenclosed perimeter of the major building, and to protect all publically accessible spaces on the adjoining property that are within 20 feet (508 mm) from an unenclosed perimeter of the major building, and also to use every reasonable means to avoid interference with the use of such equipment and spaces during the course of such construction or demolition work, provided such person causing such work is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining property and perform such work thereon as may be necessary for such purpose; otherwise, the duty of protecting such adjoining equipment and spaces shall devolve upon the owner of such adjoining property.

**Exception:** Equipment on an adjoining roof shall be protected in accordance with Section 3309.10.

**3309.14 Protection of windows.** Whenever exterior construction or demolition work occurs, and such work results in an unenclosed perimeter, it shall be the duty of the person causing such work to protect from damage, at all times during the course of such work and at his or her own expense, all windows on adjoining private property that face such work and are 20 feet (508 mm) or less from an unenclosed perimeter, provided such person causing such work is afforded a license in accordance with the requirements of Section 3309.2 to enter and inspect the adjoining property and perform such work thereon as may be necessary for such purpose; otherwise, the duty of protecting the adjoining windows shall devolve upon the owner of such adjoining building.

Where the window provides required means of lighting, ventilation, or egress, such protection shall not be allowed to interfere with such required means.

**Exceptions:** Window protection is not required for:

1. Minor alterations and ordinary repairs.
2. Work performed on a one-, two- or three-family detached house or accessory use to such.
3. Where all unenclosed perimeters are protected by vertical netting that meets the requirements of Section 3308.5, or an approved alternate system, that extends to cover the full height and width of the unenclosed perimeter; or a supported scaffold covers the full width of the unenclosed perimeter, provided the scaffold is decked and flush against the building at such level where the unenclosed perimeter exists, with no gap between the scaffold and the building greater than 3 inches (76 mm), and also provided that the scaffold is provided with netting and guardrails in accordance with Section 3314.8.

**3309.15 Modifications and alternate methods.** The commissioner may, based upon a written request from a registered design professional, modify the requirements for adjoining property protection required by this section, including the installation or use of alternative methods, provided such modification or alternative method meets or exceeds the level of surveying, monitoring, inspection, or protection, as applicable, afforded to the public and property by this section, and also provided the insurance requirements of Sections 103 and 105 of Title 28 of the *Administrative Code* are satisfied.

**3309.15.1 Request content.** A request submitted under Section 3309.15 shall include:

1. Details of the modification or alternative methods to be utilized;
2. Any stipulations;
3. Demonstration that the request meets or exceeds the level of surveying, monitoring, inspection, or protection, as applicable, afforded to the public and property by this section;
4. Where applicable, a description of the practical difficulty of complying with code requirements;
5. Where applicable, a reference to the site safety monitoring program; and
6. Where such request is made because an adjoining property owner has not afforded a license in accordance with the requirements of Section 3309.2, the request shall contain a notarized letter from the owner of the property where the project is to commence, or a duly authorized representative, certifying notification has been made to seek a license in accordance with the requirements of Section 3309.1.1.

**3309.16 Monitoring plan.** Where monitoring is required by Section 3309, such monitoring shall be in accordance with a monitoring plan developed by a registered design professional and acceptable to the commissioner. The monitoring

plan shall be specific to the structures to be monitored and operations to be undertaken, and shall specify the scope and frequency of monitoring, acceptable tolerances, and reporting criteria for when tolerances are exceeded.

## SECTION BC 3310 REQUIREMENTS FOR THE CONSTRUCTION OR DEMOLITION OF MAJOR BUILDINGS

**3310.1 Scope.** This section shall apply to:

1. The construction of a new major building;
2. The vertical or horizontal enlargement of a major building;
3. The full or partial demolition of a major building;
4. The alteration, maintenance, or repair of a façade of a major building, provided the building is more than 14 stories or 200 feet (60 960 mm) in height and also provided the façade work requires a sidewalk shed to be installed; and
5. Any construction or demolition work, including the alteration, maintenance, or repair of a façade, in a building so designated by the commissioner.

**Exception:** The requirements of this section shall not apply to partial demolition operations limited to the interior components of a major building provided no mechanical demolition equipment, other than handheld devices, are used.

**3310.1.1 Applicability of other laws.** Nothing contained herein shall diminish or supersede any other applicable city, state, or federal regulation.

**3310.2 Major buildings.** See the definition of “Major building” in Section 3302.

**3310.3 Site safety plan.** No permit shall be issued for the type of work listed in Section 3310.1 until a site safety plan that meets the requirements of Article 110 of Chapter 1 of Title 28 of the *Administrative Code* has been approved by the department.

**3310.4 Site safety monitoring program.** For a project that requires a site safety plan, the general contractor shall enact and maintain a site safety monitoring program to implement such site safety plan. The site safety monitoring program shall, at a minimum, comply with Sections 3310.5 through 3310.10.

**Exception:** Subject to the approval of the commissioner, a site safety monitoring program may be waived, reduced, or modified in accordance with Section 3310.11.

**3310.5 Site safety manager or coordinator to be designated.** One or more site safety managers shall be designated, as necessary, to ensure compliance with the site safety plan and all site safety requirements as specified in this chapter. Such site safety manager or managers shall be designated by the owner, agent, construction manager, or general contractor. All such entities shall agree to designate one such site safety manager as the primary site safety manager, or where there is only one site safety manager, such manager shall

automatically be designated as the primary site safety manager. Such site safety manager(s) shall be certified by the department in accordance with Article 402 of Chapter 4 of Title 28 of the *Administrative Code*.

**Exception:** One or more site safety coordinators, certified by the department in accordance with the requirements of Article 403 of Chapter 4 of Title 28 of the *Administrative Code*, may be designated in lieu of a site safety manager for the construction, vertical or horizontal enlargement, or full or partial demolition of a major building, provided such building:

1. Is less than 15 stories or 200 feet (60 960 mm) in height; and
2. Has a building footprint of 100,000 square feet (30 480 m<sup>2</sup>) or less.

**3310.5.1 Notification to the department of the primary manager or coordinator.** The department shall be notified of the primary site safety manager or coordinator prior to the commencement of work. In the event that an alternate site safety manager or coordinator will be acting as the primary site safety manager or coordinator for a period longer than two consecutive weeks, the department must be so notified. Any permanent change of the primary site safety manager or coordinator requires immediate notification to the department.

**3310.5.2 Presence at the site.** For the construction or alteration of a building, the primary site safety manager or coordinator shall be present at the site during all times while active work is occurring and through all phases of work, beginning with excavation and continuing until the building is enclosed and the sidewalk shed removed.

For the demolition of a building, the primary site safety manager or coordinator shall be present at the site during all times while active work is occurring and through all phases of work, beginning with the removal of any glass, asbestos, or façade and, for a full demolition, continuing until the site has been backfilled to grade, or for a partial demolition until the building is enclosed and the sidewalk shed removed.

**Exceptions:**

1. The primary site safety manager or coordinator is not required to be present at the site during the following activities, provided no other work is in progress.
  - 1.1. Surveying that does not involve the disturbance of material, structure, or earth;
  - 1.2. Use of a hoist to transport personnel only;
  - 1.3. Use of a material hoist that is fully enclosed within the perimeter of the building;
  - 1.4. Finish trowelling of concrete floors;
  - 1.5. When personnel are provided for temporary heat, light, or water;
  - 1.6. Truck deliveries to the site where the sidewalk is closed and the entrance gate is within that closed sidewalk area.

2. Subject to the approval of the commissioner, the requirement for a site safety manager, or where a site safety coordinator is authorized by this code, a site safety coordinator, may be waived entirely, or reduced to a part time basis with such part time basis determined by the commissioner, in accordance with Section 3310.11.

**3310.5.3 Acting primary site safety manager or coordinator.** Where the primary site safety manager or coordinator is unable to be at the site, an alternate site safety manager or coordinator shall act as the primary site safety manager or coordinator. Such shall be recorded in the site safety log as required by Section 3310.8.4.2, and where required by Section 3310.5.1 notification shall be provided to the department.

**3310.5.4 Limitation on primary site safety manager or coordinator serving at another site.** No site safety manager or coordinator designated as the primary site safety manager or coordinator at a site shall serve as a site safety manager or coordinator at any other site.

**Exceptions:**

1. A site safety manager or coordinator designated as the primary site safety manager or coordinator at a site may serve as a nonprimary site safety manager or coordinator at another site, provided there is no work requiring the presence of such individual in accordance with Section 3310.5.2 occurring at the site for which the individual has been designated as the primary site safety manager or coordinator.
2. Subject to the approval of the commissioner, a site safety manager or coordinator may be designated as the primary site safety manager or coordinator at two or more sites, provided all sites have had their requirement for a primary site safety manager or coordinator reduced by the commissioner to a part time basis in accordance with Section 3310.11.

**§3310.6 Reserved.**

**3310.7 Contractor shall inform personnel.** General contractors and subcontractors shall state to their directly employed personnel at the construction or demolition site, prior to such directly employed person commencing work at the site, that they are to follow all safety regulations at all times and that they are required to obey and implement all orders and directives relating to safety requirements issued by the general contractor/subcontractor or the general contractor's/subcontractor's designee. Where a site safety manager or coordinator is required, the general contractor or subcontractor shall also state to their directly employed personnel at the site, prior to such directly employed person commencing work at the site, that the site safety manager or coordinator is responsible for monitoring compliance with laws and rules governing site safety; and shall inform their supervisory personnel at the site, prior to such supervisor commencing work at the site, of the name and responsibilities of the site safety manager or coordinator. Nothing in this section shall relieve persons engaged in construction or demolition work from



their obligations under this chapter, including but not limited to Sections 3301.1 and 3301.2, and from complying with other applicable provisions of law.

### 3310.8 Site safety manager's and coordinator's duties.

The site safety manager or coordinator shall monitor compliance with the safety requirements of this chapter by performing the duties required by Sections 3310.8.1 through 3310.8.6 and by performing all other safety duties assigned by the owner or general contractor to meet legal requirements.

**3310.8.1 Meetings.** The site safety manager or coordinator shall, at a minimum, meet on a weekly basis with the designated representative of each subcontractor to ascertain that all subcontractors are complying with the applicable provisions of this chapter.

**3310.8.2 Notification of violations.** In the event the site safety manager or coordinator discovers violation of this chapter, he or she shall immediately notify the person or persons responsible for creating the violation, whether these persons are employed by the general contractor or by subcontractors. If the site safety manager or coordinator is unable to obtain the cooperation of these persons in correcting the violation, he or she shall immediately inform the direct supervisor of the person or company responsible for creating the violation and request that the supervisor order the necessary corrective action. If such supervisor is not present at the site or is otherwise unavailable, the site safety manager or coordinator shall notify any other supervisory personnel of the permit holder or any other responsible manager or officer of the permit holder. All such violations and corrective work shall be recorded in the daily log.

**3310.8.2.1 Notification of conditions to the department.** The site safety manager or coordinator shall immediately notify the department directly if he or she discovers any of the following conditions in the routine performance of the job:

1. A person is operating a crane, derrick or hoisting equipment on the site without a permit and refuses to desist from operating the equipment;
2. A crane is being operated by an unlicensed operator and such unlicensed operator refuses to desist from operating the crane;
3. No flagperson is present during crane operation where required by this chapter;
4. Sidewalk sheds required by the site safety plan are not in place during construction or demolition activity;
5. Permits have not been issued for the sidewalk sheds;
6. The designer and/or supplier of sidewalk sheds has not certified that the sheds have been erected in accordance with the approved drawings;
7. Any accident as defined by this chapter;
8. Required standpipe is not in place at each story below the construction or demolition floor;

9. Required standpipe valves are not in place at each story below the construction or demolition floor;
10. Required standpipe is not capped;
11. Required standpipe is not connected to a water source or fire department connection;
12. Required standpipe fire department hose connection is obstructed;
13. Required standpipe fire department hose connections are not marked by a red light and a sign reading, "Standpipe Connection";
14. A breach exists in the required standpipe risers, cross connections, or fire department connections;
15. The standpipe alarm activates; or
16. When a building over 75 feet (22.86 m) is being constructed or demolished and at least one elevator in a state of readiness or one hoist is not available for fire department access per Section 3303.12.

**3310.8.2.1.1 Responsibility.** Upon proper notification to the department of the existence of any of the above-noted circumstances, any responsibility the site safety manager or coordinator has under this code arising out of, relating to, or as a result of the existence of that circumstance, shall cease.

**3310.8.3 Inspections.** It shall be the responsibility of the site safety manager or coordinator to inspect personally, on a regular basis throughout the day while active work is occurring, the site to ensure compliance with the requirements of this chapter. At a minimum, inspections shall consist of those prescribed in rules promulgated by the commissioner, with such inspections performed personally by an individual certified by Chapter 4 of Title 28 of the *Administrative Code* as a site safety manager or coordinator.

**3310.8.3.1 Site safety manager or coordinator standpipe inspection responsibilities.** The site safety manager or coordinator shall, at a minimum, in accordance with rules promulgated by the department, conduct daily checks to ensure that a standpipe system is available and in a state of readiness at all times for use by firefighting personnel, by verifying:

1. That valves are in place at each story below the construction floor;
2. That standpipes are connected to a water source or fire department connection; and
3. That fire department hose connections are free from obstruction and are marked by a red light and sign that reads, "Standpipe Connection."

**3310.8.3.1.1 Weekly checks.** The site safety manager or coordinator shall also, in accordance with such rules, conduct weekly checks to verify that no breach exists by visually tracing the standpipe,



including risers, cross connections and fire department connections.

**3310.8.3.1.2 Record of inspections.** A record of all such inspections shall be maintained by such site safety manager or coordinator in the site safety log.

**3310.8.4 Site safety log.** A site safety log shall be maintained and kept at the site. The log, or where there is more than one log, the logs in total, shall, at a minimum, contain the following information:

1. Date and location of inspections performed in accordance with Section 3310.8.3;
2. Date and names of individuals met with to satisfy the requirements of Section 3310.8.1;
3. Any unsafe acts and/or conditions, and dates and locations of said unsafe acts and/or conditions;
4. Companies and representatives notified of unsafe acts and/or conditions;
5. Dates of notification of unsafe acts and/or conditions;
6. Dates of correction of unsafe acts and/or conditions and nature of correction;
7. Any accident as defined by this chapter;
8. Any violations, stop work orders, or summonses issued by the department, including date issued and date lifted or dismissed;
9. Dates and location where horizontal and vertical safety netting have been installed, replaced and/or repaired;
10. Date horizontal safety netting is removed; and
11. Date when building reaches a height of 75 feet (22 860 mm).

**3310.8.4.1 Recording inspections in the site safety log.** Inspections shall be recorded by the end of the day by the site safety manager or coordinator who performed the inspection. The site safety log, or where there is more than one log, each individual log, shall be completed and signed by the site safety manager or coordinator who performed the inspection and by the site safety manager or coordinator designated as the primary site safety manager or coordinator in accordance with Section 3310.5.1.

**Exception:** Where a part time site safety manager or coordinator is approved by the commissioner in accordance with Section 3310.11, the site safety manager or coordinator shall sign the log when he or she arrives at the site and leaves the site, and all entries in the site safety log shall be completed and signed prior to leaving the site.

**3310.8.4.2 Recording change in site safety manager or coordinator.** If at any point during the day an alternate site safety manager or coordinator acts as the primary site safety manager, this shall be noted in the log, and the acting primary site safety manager shall log in. If a site safety manager or coordinator is relieved of his or her responsibilities at the site, or a site safety man-

ager or coordinator leaves the site for any reason, this shall be indicated in the site safety log, and another site safety manager or coordinator shall assume the duties of such relieved or absent site safety manager or coordinator by signing in.

**3310.8.5 Permit log.** Any equipment brought onto the job that requires permits, as well as a description of the equipment, where it is to be located, permit number, issue and expiration date of the permit, and certificate of inspection, if required, shall be entered on a separate permit log that shall be maintained at the site by the site safety manager or coordinator and kept at the site.

**3310.8.6 Reasonable prudence.** In addition to the above requirements, the site safety manager or coordinator shall use reasonable prudence to ensure that safety is maintained at the site as job conditions dictate.

**3310.9 Additional site safety personnel.** The following additional personnel shall be employed to oversee concrete operations at a major building and such other classes of buildings or operations as the commissioner may designate by rule. These personnel shall coordinate directly with the primary site safety manager or coordinator designated in accordance with Section 3310.5.1. In all instances, the designated primary site safety manager or coordinator retains responsibility for ensuring compliance with the provisions of Section 3310 of this code and all applicable rules, and for signing the site safety log. The name and contact information of the additional site safety personnel shall be recorded in the site safety log.

**3310.9.1 Concrete safety manager.** A concrete safety manager shall be designated by the concrete contractor at those sites where the concrete portion of the project involves the pouring of a minimum of 2,000 cubic yards of concrete or such lesser amount as the commissioner may determine by rule. Concrete safety managers shall have five years of experience in concrete operations and shall have satisfactorily completed, within the five calendar years prior to registration, a thirty hour course approved by the commissioner that is sufficient to qualify the individual as a competent person under OSHA standards to oversee concrete operations, including such topics as formwork design, construction and stripping operations, rebar handling, and rigging. Concrete safety managers shall register with the department in the same manner as construction superintendents, and shall provide evidence of meeting the eligibility requirements set forth herein. No person shall perform the duties of a concrete safety manager without being registered as such with the department. The commissioner shall promulgate rules establishing the duration that such registration shall be valid and the requirements for renewal of the registration. The concrete safety manager shall be present during all concrete operations. For purposes of this section, "concrete operations" shall mean the pouring of concrete and the construction and stripping of concrete forms and related activities as specified by the commissioner.

**3310.10 Orientation and training.** All workers employed at a major building site shall receive orientation and training as required by this section.

**3310.10.1 Orientation.** All workers employed at a major building site shall receive a site-specific safety orientation program. This program shall include a review of any hazardous activities of the job that are relevant to the tasks and activities to be performed. All workers must attend such a program no later than seven days after commencing their employment at the site.

**3310.10.2 Training.** All workers employed at a major building site shall have successfully completed, within the previous five calendar years, a course that is at least ten-hours in length and approved by the United States Department of Labor Occupational Safety and Health Administration (OSHA) in construction industry safety and health, or by the commissioner covering substantially the same material.

**Exception:** A worker need not take a subsequent course that is at least ten-hours in length and approved by OSHA in construction industry safety and health, or a subsequent course approved by the commissioner covering substantially the same material, provided the worker has, within the previous five calendar years, accumulated at least five safety education units (SEU) for construction safety and health through training courses offered by a safety training program conducted by a New York State Department of Labor approved training provider registered apprenticeship program. A worker shall be credited one SEU for every four hours of construction safety and health related training completed, with a maximum of two SEUs assigned for any single course. Such SEU courses shall be conducted by, or under the supervision of, OSHA authorized construction safety trainers. Instructors who are not OSHA authorized construction trainers must be experienced in presenting the related course subject matter, and use a curriculum approved by their supervising OSHA authorized construction safety trainer.

**3310.10.2.1 Acceptable record of OSHA training.** The following shall be an acceptable record of completion of a course approved by the United States Department of Labor Occupational Safety and Health Administration (OSHA) in construction industry safety and health:

1. A bona fide course completion card;
2. A copy of such card with additional documentation outlined in Item 3 or 4 below;
3. A training roster, attendance record or other documentation from the certified trainer pending the issuance of such card; or
4. Other valid proof which may be approved by the commissioner.

**3310.10.2.2 Acceptable record of alternative training.** Successful completion of safety training alternative to the OSHA course pursuant to Section 3310.10.2 shall be evidenced by a wallet size certificate card issued by the training provider and acceptable to the commissioner. Such certificate card shall be readily

available to the commissioner upon request, and shall, at a minimum:

1. Be consistent in color with the completion card issued by the Occupational Health and Safety Administration Training Institutes for the aforementioned ten-hour course;
2. Contain the name and photograph of the individual to whom it was issued; and
3. Contain the same information as required, pursuant to rules promulgated by the commissioner, for an identification card issued upon the completion of a department approved training course.

**3310.10.2.3 Class records.** The training provider for safety training alternative to the OSHA course pursuant to Section 3310.10.2 shall maintain records in the same manner and for the same period of time as required, pursuant to rules promulgated by the commissioner, for a department approved training course.

**3310.11 Modifications to the site safety monitoring program.** The commissioner may, based upon a written request from a registered design professional, waive, reduce, or modify the requirements for the site safety monitoring program for a job of a limited scope or duration, provided such waiver, reduction, or modification is not detrimental to the safety of the public and property, or that alternative means of protection for the public and property meeting or exceeding those afforded by this section are provided. A submission under this section may include, but not be limited to, a request to reduce or modify the type or frequency of inspections performed by the site safety manager or coordinator, or to allow a part time site safety manager or coordinator, or to waive the requirement for a site safety manager or coordinator.

**3310.11.1 Request content.** A request submitted under Section 3310.11 shall include:

1. Details of the modification or alternative methods to be utilized;
2. Any stipulations;
3. A description of the work to be undertaken, for example:
  - 3.1. Type of work;
  - 3.2. Anticipated sequence and schedule;
  - 3.3. The anticipated number of suspended scaffold drops;
  - 3.4. Material handling and hoisting activities to be undertaken and equipment to be utilized;
  - 3.5. The extent of demolition activities and equipment to be utilized;
  - 3.6. Impact on the standpipe or sprinklers;
  - 3.7. Use of welding, torches, or similar equipment;
  - 3.8. Proximity to adjoining buildings or areas accessible to the public.
4. Demonstration that the request is not detrimental to the safety of the public and property, or that alternative means of protection for the public and property

meet or exceed those afforded by this section are provided;

5. A description of the practical difficulty of complying with the site safety monitoring program requirements set forth in Section 3310;
6. Where the request is to reduce or modify the type or frequency of inspections performed by the site safety manager or coordinator, a proposed alternative list of site safety inspections;
7. Where the request is to allow a part time site safety manager or coordinator, a proposed schedule for the site safety manager or coordinator, as well as a proposed list of duties and site safety inspections to be performed by the site safety manager or coordinator while he or she is present at the site; and
8. Where the request involves a waiver of the site safety monitoring program or a request to allow a part time site safety manager or coordinator, a signed, dated, and notarized affidavit from a contractor or licensee stating he or she will be responsible for ensuring compliance with the site safety provisions of this code at the site at all times the site safety manager or coordinator is not present, with emergency contact information for such contractor or licensee provided.

## SECTION BC 3311

### EXPLOSIVE POWERED AND PROJECTILE TOOLS

**3311.1 Scope.** Explosive powered tools, including but not limited to powder-actuated tools and projectile tools, used in connection with the construction or demolition of a building or structure shall be in accordance with the requirements of this section.

**3311.2 Projectile tools.** Projectile tools shall comply with the requirements of Sections 3311.2.1 through 3311.2.3.

**3311.2.1 Basic requirements.** Design and construction of the tool must be such as to safely retain all internal pressures that may occur during its operation. The discharge mechanism shall be such that the projectile cannot be discharged by dropping the tool. The discharge mechanism shall be such that the discharge of each projectile shall be dependent on a separate and distinct act by the operator, and all safety features shall be durable.

A tool shall have such other characteristics as the commissioner may find necessary. Such other characteristics may include devices and materials external to the tool itself but associated with its function, and may also include, in respect to high velocity projectile tools, the basic requirements set forth above for explosive powered tools that discharge projectiles with comparable velocities.

**3311.2.2 Maintenance.** Every projectile tool shall be properly maintained. No such tool shall be used if any part necessary to retain internal pressures or to prevent accidental discharge of a projectile is not in sound and operable condition.

**3311.2.3 Operation.** The operation of projectile tools shall comply with the following:

1. A projectile tool shall be operated only by an authorized operator who shall be the owner, lessee, or other person having custody of the tool, or any other person whom he or she may authorize to operate it.
2. While a projectile tool is in the care and custody of an authorized operator, no other person shall handle or in any way utilize or modify it.
3. No authorized operator of a projectile tool shall leave it unattended while it is in a condition to discharge a projectile.
4. No person shall use a projectile tool for any purpose other than that for which it was manufactured.
5. No person shall point a projectile tool at another person or hold it at an angle that allows the projectile to fly free.
6. No person shall use a projectile tool in such a way as to endanger persons who may be in the vicinity.

**3311.3 Explosive powered tools.** The provisions of ANSI A10.3, as modified in Section 3311.4, shall apply to explosive powered tools, including but not limited to powder-actuated tools. The storage, handling and use of explosives shall also comply with the *New York City Fire Code* and Section 3307.4.2.

**3311.4 Modifications to ANSI A10.3.** The text of ANSI A10.3 shall be modified as indicated in Sections 3311.4.1 through 3311.4.12.

**3311.4.1 ANSI A10.3, Section 4.2.2.** Delete Sections 4.2.2.2, 4.2.2.3 and 4.2.2.4 in their entirety and modify Section 4.2.2.1 to read as follows:

4.2.2.1 Medium-velocity tools, indirect-acting (piston) type, as defined in Section 3, shall not be used.

**3311.4.2 ANSI A10.3, Section 4.2.3.** Delete Sections 4.2.3.2, 4.2.3.3 and 4.2.3.4 in their entirety and modify Section 4.2.3.1 to read as follows:

4.2.3.1 High velocity tools, direct-acting or indirect-acting type, as defined in Section 3, shall not be used.

**3311.4.3 ANSI A10.3, Section 4.3.** Delete Section 4.3 in its entirety.

**3311.4.4 ANSI A10.3, Section 5.5.** Add a new section 5.5 to read as follows:

5.5 Selection of load. No employer shall knowingly furnish to an employee for use in a tool any cartridge or load not suitable for safe use in that tool, whether by reason of excessive power, improper design or poor material. The operator shall use due care to select the proper cartridges or power loads, or other means of controlling the force of the explosion so that the tool develops no more than the necessary pressure to bring about the desired penetration. In doing so, the operator shall be guided by the manufacturer's specifications.

5.5.1 Proper load. When doubt exists as to proper load, the operator shall make a trial shot to test the surface and the strength of the material to be pene-







- 2.3. The installation, use, and removal of the scaffold is confined within the site or over an area protected by sidewalk sheds or roof protection.
- 3. Window washing equipment that is permanently anchored to the building or structure by a davit.
- 4. A permit is not required for a supported scaffold, provided:
  - 4.1. The scaffold is not an outrigger scaffold (thrust out);
  - 4.2. No hoisting equipment with a manufacturer's rated capacity greater than 2,000 pounds (907 kg) will be located on the scaffold;
  - 4.3. The scaffold will not be loaded, or designed to be loaded, in excess of 75 pounds per square foot (366.15 kg/m<sup>2</sup>); and
  - 4.4. The scaffold is less than 40 feet (12 192 mm) in height.

### 3314.3 Design. Scaffolds shall be designed, as follows.

**3314.3.1 Supported scaffolds and outrigger scaffolds (thrust out).** Supported scaffolds and outrigger scaffolds (thrust out) shall be designed by a registered design professional. Where the scaffold is to be located upon a sidewalk shed, the requirements of Section 3307.6.4.2.2 shall also apply.

**Exception:** Design is not required for a supported scaffold, provided:

- 1. The scaffold is not an outrigger scaffold (thrust out);
- 2. No hoisting equipment with a manufacturer's rated capacity greater than 2,000 pounds (907 kg) will be located on the scaffold;
- 3. The scaffold will not be loaded, or designed to be loaded, in excess of 75 pounds per square foot (366.15 kg/m<sup>2</sup>);
- 4. The scaffold is less than 40 feet (12 192 mm) in height;
- 5. Side-arm or end-arm scaffold brackets are used exclusively for the support of workers; and
- 6. The scaffold is a light duty scaffold, a medium duty scaffold, or a heavy duty scaffold.

**3314.3.2 Suspended scaffolds.** Suspended scaffolds shall be designed by a registered design professional.

**Exceptions:**

- 1. Design is not required for a single tier nonadjustable suspended scaffold whose platform is 40 square feet (12 192 mm) or less in size.
- 2. In lieu of a registered design professional, a two-point, single tier, suspended scaffold may be designed by a licensed rigger provided:
  - 2.1. The scaffold or scaffold outrigger beam or suspension member support structure is not anchored to the building or structure, other than tiebacks; and

2.2. The scaffold will not be loaded, or designed to be loaded, in excess of 75 pounds per square foot (366.15 kg/m<sup>2</sup>); and either

2.2.1. The scaffold utilizes c-hooks; or

2.2.2. The distance from floor or roof on which the support structure is located to the top of the outrigger beam or suspension member support structure is less than 15 feet (4572 mm)†.

3. In lieu of a registered design professional or a licensed rigger, a two-point, single tier, suspended scaffold meeting the requirements of Item 2 of these exceptions that is used exclusively for sign hanging work may be designed by a licensed sign hanger.

**3314.3.3 Drawings.** Where design is required by this section, the drawings shall, at a minimum, include a plan view and an elevation view, with full dimensions, detailing:

- 1. The location of the scaffold;
- 2. Connections and attachments to the base structure, including but not limited to anchorages, fastenings, tie-ins, tie-backs, and lifelines;
- 3. Any structural modifications required to the base structure;
- 4. Netting with specific type and manufacturer indicated, overhead protection, or any other equipment attached to the scaffold;
- 5. Any hoisting equipment located on the scaffold;
- 6. Platform levels, support centers, and offsets, along with the maximum number of levels to be loaded simultaneously and the maximum loads to be imposed;
- 7. For a suspended scaffold, ropes, number of clips, and counterweights, as well as outrigger beams or other support devices;
- 8. For a suspended scaffold that will not be lowered to the street or deck of the sidewalk shed at the end of the shift, how the scaffold will be secured while work is not being performed; and
- 9. For a supported scaffold, structural members, as well as the founding of the scaffold, including but not limited to sidewalk sheds, floors, roofs, or ground.

**3314.3.4 Loads imposed.** Where a supported scaffold sits on a sidewalk shed or other temporary structure, the scaffold drawings shall be accompanied by a loads imposed letter signed, sealed, and dated by a registered design professional. The letter shall detail the loads to be imposed by the scaffold onto the base structure and indicate that the registered design professional has reviewed the adequacy of the base structure to sustain the load imposed.

**3314.4 Installation, inspection, repair, maintenance, adjustment, use, and removal of scaffolds.** Scaffolds shall

be installed, inspected, repaired, maintained, adjusted, used, and removed in accordance with the specifications of the manufacturer, where such specifications exist, and the requirements of Sections 3314.4.1 through 3314.4.8.

**3314.4.1 Installation and removal.** Scaffolds shall be installed and removed in accordance with the requirements of Sections 3314.4.1.1 through 3314.4.1.5.

**3314.4.1.1 Supervision of suspended scaffold installation and removal.** Suspended scaffolds shall be installed and removed by or under the direct and continuing supervision of a licensed rigger.

**Exceptions:** In lieu of direct and continuing supervision by a licensed rigger:

1. The installation and removal of a suspended scaffold utilized exclusively for sign hanging work may be performed by or under the direct and continuing supervision of a licensed sign hanger.
2. The installation and removal of a suspended scaffold may be supervised by a competent person designated by the scaffold permit holder, or where there is no scaffold permit holder, designated by the scaffold controlling entity, provided such scaffold is installed and removed in conjunction with:
  - 2.1. The construction of a new building;
  - 2.2. The full demolition of an existing building;
  - 2.3. The vertical or horizontal enlargement of an existing building; or
  - 2.4. The alteration, maintenance, or repair of a façade of a major building where a site safety plan is required by Section 3310.3.
3. The lateral relocation of a wheel or track mounted scaffold and tiebacks may be supervised by a competent person designated by the scaffold controlling entity, provided the design developed by the registered design professional allows for such relocation, and also provided such lateral relocation occurs without the addition or removal of any part, component, attachment, counterweight, anchorage, or connection to the base building or structure, other than tie-backs so long as such tie-backs are placed as designated on the approved plan.

**3314.4.1.2 Supervision of supported scaffold installation and removal.** The installation and removal of a supported scaffold shall be supervised by a competent person designated by the contractor installing or removing the scaffold.

**3314.4.1.3 Supervisor to be present at the site.** The licensee or competent person supervising the installation or removal of a scaffold shall be present at the site during all installation and removal work and shall have the ability to communicate with all individuals

involved in the installation or removal work. Where only one person is installing or removing a scaffold, such person shall be deemed to be the supervisor present at the site and must have the qualifications and training required by this chapter to serve as a supervisor for such work.

**Exception:** The licensed rigger or sign hanger does not have to be present at the site, provided a suspended scaffold foreman is present at the site during all installation and removal work and provided such suspended scaffold foreman has the ability to communicate with all individuals involved in the installation or removal work.

**3314.4.1.4 Training.** All individuals involved in the installation or removal of a supported scaffold or an adjustable suspended scaffold, including the person supervising such work, shall have been trained as required by Section 3314.4.5.

**3314.4.1.5 Notification of adjustable suspended scaffold installation and removal.** Prior to the initial installation of the adjustable suspended scaffold at a site, and prior to the final removal of the adjustable suspended scaffold at a site, the department shall be notified at least 24 hours, but not more than 48 hours, prior to such installation or removal. Such notification:

1. Where the installation or removal occurs under the direct and continuing supervision of a licensed rigger or sign hanger, shall be made by such licensee; or
2. Where the installation or removal does not occur under the direct and continuing supervision of a licensed rigger or sign hanger, shall be made by the designer of the scaffold.

**3314.4.2 Use of scaffolds.** Scaffolds shall be used in accordance with the requirements of Sections 3314.4.2.1 through 3314.4.2.5.

**3314.4.2.1 Supervision of suspended scaffold use.** Suspended scaffolds shall be used by or under the direct and continuing supervision of a licensed rigger.

**Exceptions:**

1. In lieu of direct and continuing supervision by a licensed rigger, the use of a suspended scaffold utilized exclusively for sign hanging work may be performed by or under the direct and continuing supervision of a licensed sign hanger.
2. In lieu of direct and continuing supervision by a licensed rigger, the use of a suspended scaffold may be supervised by a competent person designated by the scaffold controlling entity, provided such scaffold is used in conjunction with:
  - 2.1. The construction of a new building;
  - 2.2. The full demolition of an existing building;

2.3. The vertical or horizontal enlargement of an existing building; or

2.4. The alteration, maintenance, or repair of a façade of a major building where a site safety plan is required by Section 3310.3.

3. Where a scaffold is used by or under the direct and continuing supervision of a licensed rigger, a registered design professional who is not in the direct employ of the licensee or business of the licensee may ride on a suspended scaffold to perform inspections provided the registered design professional:

3.1. Does not perform construction, maintenance, repair, or demolition work from the scaffold;

3.2. Does not operate the scaffold; and

3.3. Is familiar with the use of the scaffold, safety equipment, and emergency procedures.

4. Where a scaffold is used by or under the direct and continuing supervision of a licensed rigger, a specialty crew who is not in the direct employ of the licensee or business of the licensee may use the suspended scaffold, provided:

4.1. The work requires a specialty trade, including but not limited to work with hazardous materials or chemicals;

4.2. The crew is in accordance with rules promulgated by the commissioner; and

4.3. The members of the crew are approved by the commissioner.

**3314.4.2.2 Supervision of supported scaffold use.** The use of a supported scaffold shall be supervised by a competent person designated by the scaffold controlling entity.

**3314.4.2.3 Installer who is not the scaffold controlling entity.** Where the contractor or licensee that installed the scaffold is not the scaffold controlling entity, the installer shall have no supervisory responsibility for the use of the scaffold.

**3314.4.2.4 Supervisor to be present at the site.** The licensee or competent person supervising the use of a scaffold shall be present at the site during all times the scaffold is in use and shall have the ability to communicate with all individuals using the scaffold; however, such supervisor does not need to be on the scaffold.

**Exception:** The licensed rigger or sign hanger does not have to be present at the site, provided a suspended scaffold foreman is present at the site during all times the scaffold is in use and provided such suspended scaffold foreman has the ability to communicate with all individuals using the scaffold. Such suspended scaffold foreman does not need to be on the scaffold.

**3314.4.2.5 Users.** All individuals using a supported scaffold or an adjustable suspended scaffold, including the person supervising such use, shall have been trained as required by Section 3314.4.5.

**3314.4.3 Inspections.** Scaffolds shall be inspected in accordance with the requirements of Sections 3314.4.3.1 through 3314.4.3.6.

**3314.4.3.1 Inspection prior to the installation of a suspended scaffold.** Prior to the installation of a suspended scaffold, all suspended scaffold support devices, including but not limited to outrigger beams and C-hooks, along with the support surface upon which they rest, shall be inspected by a qualified person. The qualified person shall:

1. Where the installation or removal occurs under the direct and continuing supervision of a licensed rigger or sign hanger, be designated by such licensee; or

2. Where the installation or removal does not occur under the direct and continuing supervision of a licensed rigger or sign hanger, be designated by the designer of the scaffold.

**Exception:** An inspection is not required for a non-adjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.4.3.1.1 Special provision for parapet clamps.** Where parapet clamps are to be utilized, the qualified person who inspects the support surface as required by Section 3314.4.3.1 shall be a registered design professional.

**3314.4.3.2 Installation inspection for suspended scaffolds.** Upon completion of the installation of a suspended scaffold, the scaffold, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold shall be inspected prior to use to verify that they are in a safe condition and, where design is required, installed in accordance with the design drawings. The individual performing the inspection shall have completed the training required by Section 3314.4.5.3 and shall be:

1. Where the scaffold was designed by a licensed rigger or sign hanger, or installed by or under the direct and continuing supervision of a licensed rigger or sign hanger:

1.1. The licensee; or

1.2. A suspended scaffold foreman; or

2. Where the scaffold was not designed by a licensed rigger or sign hanger, or installed by or under the direct and continuing supervision of a licensed rigger or sign hanger:

2.1. The scaffold designer;

2.2. An employee of the scaffold designer under his or her direct supervision;

2.3. A registered design professional retained by the scaffold designer; or



- 2.4. An employee of such retained registered design professional under the direct supervision of such retained registered design professional.

**Exceptions:** An installation inspection is not required for:

1. A nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed; or
2. The lateral relocation of a wheel or track mounted scaffold and tiebacks, provided the design developed by the registered design professional allows for such relocation, and also provided such lateral relocation occurs without the addition or removal of any part, component, attachment, counterweight, anchorage, or connection to the base building or structure, other than tie-backs. Following such lateral relocation, the scaffold, and any re-installed tie-back, shall be inspected and documented under the requirements of Section 3314.4.3.4.

**3314.4.3.2.1 Installation inspection report.** The results of the inspection shall be documented in an installation inspection report signed and dated by the person who performed the inspection. The scaffold shall not be used until it has passed such inspection and the installation inspection report has been completed.

**Exception:** An installation inspection report is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.4.3.3 Installation inspection for supported scaffolds.** Upon completion of the installation of a supported scaffold, the scaffold, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold shall be inspected prior to use to verify that they are in a safe condition and, where design is required, installed in accordance with the design drawings. Such inspection shall be performed by a qualified person who has completed the training required by Section 3314.4.5.1 and who is designated by the designer, the installer, or a third party acceptable to both the designer and the installer. The results of the inspection shall be documented in an installation inspection report signed and dated by the person who performed the inspection. The scaffold shall not be used until it has passed such inspection and the installation inspection report has been completed.

**Exceptions:**

1. Where additional components or attachments are installed to an existing supported scaffold, or where existing deck planking or guardrails are relocated to a different level, the installation inspection and installation inspection

report shall be limited to such components or attachments and related anchorages.

2. An inspection and report is not required for a supported scaffold that, pursuant to Section 3314.3.1, is not required to be designed.

**3314.4.3.4 Pre-shift inspection for a suspended scaffold.** Suspended scaffolds shall be inspected prior to each shift in accordance with a pre-shift inspection checklist that meets the requirements of Section 3314.4.3.4.2. The scaffold shall not be used until it has passed such inspection and the results have been documented on the checklist. The checklist shall be kept at the site by the scaffold controlling entity.

**Exception:** A pre-shift inspection is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.4.3.4.1 Responsibility for performing the inspection and signing the checklist.** The inspection required by Section 3314.4.3.4 shall be performed by, and the checklist required by Section 3314.4.3.4.2 shall be signed and dated by the licensee, suspended scaffold foreman, or competent person who is onsite and responsible for supervising the scaffold under the provisions of Section 3314.4.2.4.

**3314.4.3.4.2 Pre-shift inspection checklist contents.** The pre-shift inspection checklist shall be based on the manufacturer requirements for the inspection of the scaffold, where such requirements exist, and shall, at a minimum, include an inspection prior to each shift to verify the scaffold remains in a safe condition for use, and shall also include a comprehensive inspection following high winds. Such checklist shall be:

1. Where the scaffold was designed by a licensed rigger or sign hanger, or installed by or under the direct and continuing supervision of a licensed rigger or sign hanger, developed by the licensee; or
2. Where the scaffold was not designed by a licensed rigger or sign hanger, or installed by or under the direct and continuing supervision of a licensed rigger or sign hanger, developed by the registered design professional who designed the scaffold.

**Exception:** A pre-shift inspection checklist is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.4.3.5 Pre-shift inspection for a supported scaffold.** Prior to each shift the supported scaffold shall be inspected by the competent person supervising the use of the scaffold in accordance with Section 3314.4.2.2 to verify the scaffold remains in a safe condition for use. The results of the inspection shall be documented in a pre-shift inspection report signed and dated by the person who performed the inspection. The scaffold shall



not be used until it has passed such inspection and the pre-shift inspection report has been completed.

**Exception:** An inspection report is not required for a supported scaffold that is not required to be designed under Section 3314.3.1.

**3314.4.3.6 Inspection following a site repair or adjustment.** Following a repair or adjustment to a scaffold at a site, the portion adjusted or repaired shall be inspected by the person who supervised the adjustment or repair in accordance with Sections 3314.4.6 or 3314.4.7 to verify the adequacy of such adjustment or repair. A description of the adjustment or repair, and the results of the inspection, shall be recorded, signed, and dated by such supervisor and kept with the inspection report required by Sections 3314.4.3.4 or 3314.4.3.5. The scaffold shall not be used until it has passed such inspection and the results of the inspection have been documented.

**Exceptions:**

1. The scaffold may be used prior to the inspection where authorized in accordance with Section 3314.4.4.7.
2. An inspection and report is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.4.4 Safeguards.** The safeguards required by Sections 3314.4.4.1 through 3314.4.4.8 shall be observed at all times.

**3314.4.4.1 Safe working order.** Scaffolds, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold shall be provided to the site in a safe working order by their respective owner, with no known hazardous conditions, defective repairs, or maintenance problems that could compromise the safety of the public and property.

**3314.4.4.2 Loads.** At no time shall a scaffold be loaded beyond the capacity of the scaffold or the ground or structure upon which it rests or is supported. Loads shall not be concentrated so as to cause stresses in excess of the allowable values designated for the applicable material described in this code.

**3314.4.4.3 Capacity.** Each scaffold, and its components, shall be capable of supporting, without failure, its own weight and at least four times the maximum intended load applied or transmitted to it. Where applicable, scaffolds and their connections to the building or structure shall be designed to meet the anticipated loads during construction or demolition work, including wind loads as prescribed in Chapter 16. Each suspension rope, including connecting hardware, used on nonadjustable suspended scaffolds shall be capable of supporting, without failure, at least six times the maximum intended load applied or transmitted to the rope.

**3314.4.4.4 Stable and secure.** The scaffold and all materials and equipment located on or used from the scaffold shall be kept stable and secure at all times to

prevent the scaffold from losing balance, overturning, or collapsing, and to prevent any object from falling from the scaffold.

**3314.4.4.5 Dislodgement.** Material and equipment susceptible to dislodgement shall not be stored on a scaffold while work is not being performed.

**3314.4.4.6 Winds.** Where sustained winds or wind gusts at the site exceed 30 miles per hour, the use and operation of scaffolds located on the roof of a building, exterior to a building or structure, on a working deck, or in an area with an unenclosed perimeter shall cease. If the manufacturer or designer of the scaffold recommends work to cease at a lower wind speed, such recommendation shall instead apply. Wind speed shall be determined based on data from the nearest United States weather bureau reporting station, or an anemometer located at the site, freely exposed to the wind, and calibrated in accordance with ASTM D 5096-02.

**3314.4.4.7 Use during installation, repairs, maintenance, adjustments, or removal.** Only personnel, materials, and uses authorized by the person responsible for supervising the installation, repair, maintenance, adjustment, or removal of a scaffold shall be located on and using the scaffold during such work.

**3314.4.4.8 Noncombustible construction.** With the exception of the planking, the following scaffolds shall be constructed of noncombustible materials:

1. Exterior scaffolds exceeding 75 feet (22 860 mm) in height.
2. Interior scaffolds exceeding 21 feet (6.4 m) in height.
3. All scaffolds used in the alteration, repair, or partial demolition of buildings in Occupancy Groups I-1 to I-4.

**3314.4.5 Training.** Only those who are qualified to install, adjust, maintain, repair, use, or remove a scaffold, and are trained in accordance with the requirements of this section, shall perform such work or supervise such work. No person shall knowingly permit or cause an individual who does not have the experience and training required by this section to install, adjust, modify, repair, use, or remove a scaffold.

**3314.4.5.1 Training for supported scaffold installers, adjusters, repairers, maintainers, inspectors, or removers.** Workers who install, adjust, repair, maintain, inspect, or remove a supported scaffold that is 40 feet (12 192 mm) or more in height, including the person supervising such, shall, at a minimum, have completed a department-approved training program or course that is at least 32 hours long and shall complete a department-approved 8-hour refresher program or course every 4 years thereafter. Workers who install, adjust, repair, maintain, or remove a sidewalk shed that provides a base for a supported scaffold that is 40 feet (12 192 mm) or more in height, including the person supervising such, are subject to the above requirements.

**Exceptions:**

1. The installation, adjustment, maintenance, repair, or removal of a supported scaffold performed by an employee of a public utility, including the person supervising such, where such supported scaffold is located within the interior of a structure owned or operated by such utility, and when such utility has a training safety program or course of not less than 32 hours for its employees who perform such scaffold work.
2. Where existing supported scaffold deck planking or guardrails are being relocated to a different level of the scaffold in accordance with the design, such may be performed by individuals who have completed the training required by Section 3314.4.5.2.

#### 3314.4.5.2 Training for supported scaffold users.

Individuals who use a supported scaffold, including the person supervising such, shall, at a minimum, have completed a department-approved training program or course that is at least 4 hours long and, every four years thereafter, retake the 4-hour training program or course.

##### Exceptions:

1. Employees of a public utility performing work while using a supported scaffold, including the person supervising such, provided that such employees are trained to be able to recognize the hazards associated with the type of supported scaffold being used and to understand the procedures to control those hazards.
2. A registered design professional who has not completed the training may use a supported scaffold to perform inspections provided the registered design professional does not perform construction, maintenance, repair, or demolition work from the scaffold.

#### 3314.4.5.3 Training for suspended scaffold supervisors.

Individuals who exercise supervisory responsibility in accordance with the requirements of Sections 3314.4.1 through 3314.4.4 for the installation, adjustment, repair, maintenance, use, or removal of a suspended scaffold shall, at a minimum, have completed a department-approved training program or course that is at least 32 hours long and, four years following completion of the 32-hour program or course, and every four years thereafter, complete a department-approved 8-hour refresher program or course.

**Exception:** Individuals supervising the installation, adjustment, modification, repair, use, or removal of a nonadjustable suspended scaffold.

#### 3314.4.5.4 Training for suspended scaffold installers, adjusters, repairers, maintainers, users, inspectors, or removers.

Individuals who install, adjust, repair, maintain, use, inspect, or remove a suspended scaffold shall, at a minimum, have completed a department-approved training program or course that is at least 16 hours long and, four years following comple-

tion of the 16-hour program or course, and every four years thereafter, complete a department-approved 8-hour refresher program or course.

##### Exceptions:

1. A registered design professional who has not completed the training may ride on a suspended scaffold to perform inspections provided the registered design professional does not perform construction, maintenance, repair, or demolition work from the scaffold, or operate the scaffold, and provided the registered design professional is familiar with the use of the scaffold, safety equipment, and emergency procedures.
2. Individuals who install, adjust, repair, maintain, use, or remove a nonadjustable suspended scaffold, including the person supervising such use.
3. A person who possesses a valid challenge examination certificate issued prior to January 1, 2014 need not take a new 16-hour initial program or course but shall be required to complete the 8-hour refresher program or course every 4 years, beginning from the date of enactment of this code.

**3314.4.5.5 Course providers.** Training programs or courses required by this section shall be conducted by a registered New York State Department of Labor apprenticeship training program or by an educational institution or school chartered, licensed or registered by the New York State Department of Education or by a provider approved by the department and presented by an instructor acceptable to the commissioner.

**3314.4.5.6 Course curriculums.** All training programs or courses required by this section shall be based on the scaffold requirements of this chapter and shall include, but not be limited to, instruction on the type of scaffold the training covers and associated hazards, common causes of scaffold accidents and steps to avoid such accidents, scaffold components, scaffold connections to a structure, scaffold inspection, the maximum intended load and load-handling capacities of scaffolds, and the prevention of overload conditions. Curriculums for scaffold users shall be focused on the proper use of the scaffold. Curriculums for scaffold installers, adjusters, maintainers, repairers, and removers shall be focused on the proper execution of such work. Curriculums in excess of eight hours in length shall include a significant portion of hands-on training.

**3314.4.5.7 Evaluation.** Successful completion of a training program or course that is more than 4 hours in length shall be based upon a written performance evaluation. For courses that are 16 hours or greater in length, successful completion shall also be based upon passage of a hands-on performance evaluation.

**3314.4.5.8 Certificate card.** Successful completion of the training program or course shall be evidenced by a

wallet size certificate card issued by the training provider and acceptable to the commissioner. Such certificate card shall be readily available to the commissioner upon request and shall contain, at a minimum, the name and photograph of the individual to whom it was issued, as well as any other information required pursuant to rules promulgated by the commissioner for a department approved training course.

**3314.4.5.9 Grace period.** For individuals who fail to complete the required refresher program or course within any 4 year period, a refresher program or course shall be considered timely if completed within 1 year after the expiration date of the last previously completed initial or refresher program or course. During such period, such individual shall not perform or supervise any activity for which the lapsed training is required to perform or supervise such activity until such individual has successfully completed such refresher program or course. Where more than 1 year has lapsed, such individual shall be required to successfully recomplete the initial training program or course.

**3314.4.6 Adjustments.** Scaffolds, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold installed at a site shall be adjusted under the supervision of a competent person designated by the contractor or licensee who installed the scaffold. Individuals who perform adjustments, and the person supervising such, shall be trained in accordance with Section 3314.4.5. Following the adjustment, the scaffold shall be inspected in accordance with Section 3314.4.3.6.

**Exception:** Where a sidewalk shed provides the base for a supported scaffold, the sidewalk shed shall be adjusted in accordance with the requirements of Section 3307.6.

**3314.4.7 Repairs.** Scaffolds, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold installed at a site shall be repaired under the supervision of a competent person designated by the equipment owner. Individuals who perform repairs, and the person supervising such, shall be trained in accordance with Section 3314.4.5. Following the repair, the scaffold shall be inspected in accordance with Section 3314.4.3.6.

**Exceptions:**

1. Where a sidewalk shed provides the base for a supported scaffold, the sidewalk shed shall be repaired in accordance with the requirements of Section 3307.6.
2. Components and attachments may be replaced under the supervision of a competent person designated by the contractor or licensee who installed the scaffold.

**3314.4.8 Maintenance.** Scaffolds, all components of and attachments to the scaffold, and all supports and anchorages of the scaffold installed at a site shall be maintained in a good condition by a qualified person designated by the scaffold controlling entity. Individuals maintaining a scaffold shall have been trained in accordance with Sec-

tion 3314.4.5. Individuals who maintain an adjustable suspended scaffold hoist shall also have been trained and authorized by the manufacturer of the scaffold hoist. A description of the maintenance shall be recorded, signed, and dated by the person who performed the maintenance and kept with the inspection checklist or report required by Section 3314.4.3.4 or 3314.4.3.5.

**Exceptions:**

1. Where a sidewalk shed provides the base for a supported scaffold, the sidewalk shed shall be maintained in accordance with the requirements of Section 3307.6.
2. A description of the maintenance is not required for a nonadjustable suspended scaffold that, pursuant to Section 3314.3.2, is not required to be designed.

**3314.5 Platform construction.** Platforms on all working levels of a scaffold shall be fully planked or decked between the front uprights and the guardrail system supports in accordance with Sections 3314.5.1 through 3314.5.6.

**Exception:** Platforms used solely as walkways or used solely by workers installing or removing the scaffold shall be planked to the extent necessary to ensure the safety of the public and property.

**3314.5.1 Platform spacing.** Each platform unit shall be installed so that the space between adjacent units and the space between the platform and the uprights is no more than 1 inch (25 mm) wide except where a qualified person can demonstrate that a wider space is necessary.

**3314.5.2 Maximum span for wood plank.** All lumber used in scaffolds or their supports shall be at least equal in strength and quality to construction grade lumber in accordance with Section 2301. See Table 3314.5.2 for the maximum span for scaffold planks.

**TABLE 3314.5.2  
MAXIMUM PERMISSIBLE SPANS FOR  
2-INCH PLANK USED ON SCAFFOLDS**

MATERIAL	FULL THICKNESS UNDRESSED LUMBER			LUMBER OF NOMINAL THICKNESS		
	25	50	75	25	50	75
Working Load (psf)	25	50	75	25	50	75
Permissible Span (ft)	10	8	6	8	6	5

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 47.88 Pa,  
1 foot = 304.8 mm.

**3314.5.3 Minimum overhang.** The end of a platform shall extend over the centerline of its support a minimum of 6 inches (152 mm) unless cleated or otherwise restrained by hooks or equivalent means.

**3314.5.4 Maximum cantilever.** The maximum cantilever shall be as follows.

**3314.5.4.1 Ten feet or less.** The end of a platform 10 feet (3048 mm) or less in length shall not extend over the centerline of its support more than 12 inches (305 mm) unless the platform and its tiedown are designed by a qualified person or the platform has guardrails to prevent access to the cantilevered end.



**3314.5.4.2 More than ten feet.** The end of a platform more than 10 feet (3048 mm) in length shall not extend over the centerline of its support more than 18 inches (457 mm) unless the platform and its tiedown are designed by a qualified person or the platform has guardrails to prevent access to the cantilevered end.

**3314.5.5 Platform tiedown.** All platforms shall be tied down or otherwise positively restrained by hooks or equivalent means to prevent dislodgment in all directions.

**3314.5.6 Platform deflection.** Platforms shall not deflect more than 1/60 of the span when loaded.

**3314.6 Footings and anchorage.** The footings and anchorage for every scaffold shall be sound and rigid, capable of carrying the maximum load without excessive settlement or deformation and secure against movement in any direction. Supports such as barrels, boxes, loose brick, loose stone, or other unstable materials shall not be used.

**3314.6.1 Safe points of anchorage.** Safe points of anchorage include structural members of a building. Window washing anchors, window frames, mullions, handrails, standpipes, vents and other piping systems, electrical conduit, counterweights or similar elements shall not be used as anchors or braceback points.

**Exception:** Window washing anchor points that are part of the base building structure may be utilized as an anchor or braceback point for a scaffold, subject to the approval of the commissioner. The anchor points shall be inspected by a registered design professional prior to use to verify their ability to support all loads imposed. At the end of the job, the anchor points shall be restored to their original condition, any damage repaired, and inspected by a registered design professional to verify such. A report verifying such restoration and inspection shall be prepared by the registered design professional and submitted to the department.

**3314.6.2 Lifeline anchorage.** Lifeline anchorage shall be fastened to a fixed safe point of anchorage, shall be independent of the scaffold, and shall be protected from sharp edges and abrasion.

**3314.6.3 Lifelines and suspension ropes.** Lifelines, tiebacks, and suspension ropes shall each be attached to a different point of anchorage.

**3314.6.4 Scaffolds supported on structure.** Loads from supported and suspended scaffolds imposed on an existing roof or floor or similar structure shall:

1. Not be concentrated so as to cause stresses in excess of the allowable values designated for the applicable material described in this code; or
2. Be distributed with dunnage or shoring so as to prevent such load from exceeding the allowable values designated for the applicable material described in this code.

**3314.7 Outrigger beams.** Outrigger beams shall be made of structural metal or equivalent strength material and shall be restrained to prevent movement.

**3314.7.1 Overhang.** The overhang of outrigger beams shall not exceed that specified by the design and the inboard length of beam shall be at least one and one-half times the outboard length unless otherwise designed by a registered design professional.

**3314.7.2 Placement.** Outrigger beams shall be placed so that the suspension ropes will hang vertically.

**3314.7.3 Outrigger beam end of suspension ropes.** Suspension ropes shall be securely fastened to the outrigger beams by steel shackles, thimbles, or equivalent means.

**3314.7.4 Load end of wire suspension ropes.** The load end of wire suspension ropes shall be equipped with proper size thimbles and secured by eyesplicing or equivalent means.

**3314.8 Guardrail system and debris netting.** The open sides and ends of scaffold platforms shall be provided with a guardrail system that meets the requirements of Section 3314.8.1 and debris netting that meets the requirements of Section 3314.8.2.

#### Exceptions:

1. A guardrail system and debris netting are not required while the scaffold is being installed or removed but shall be in place before the scaffold is used.
2. A guardrail system and debris netting is not required along the edge of a scaffold facing a building or structure, provided the distance from the edge of the scaffold platform to the face of the building or structure is:
  - 2.1. For an outrigger scaffold, 3 inches (80 mm) or less;
  - 2.2. For a scaffold used in conjunction with plastering and lathing operations, 18 inches (460 mm) or less; or
  - 2.3. For all other scaffolds, 14 inches (360 mm) or less.
3. Notwithstanding the provisions of Sections 3308.6.1.4 and 3314.9.4, debris netting is not required along the perimeter of a scaffold provided such perimeter is set-back from all adjoining property and areas that remain open to the public at a distance that is equal to or greater than half the height of scaffold.
4. Notwithstanding the provisions of Sections 3308.6.1.4 and 3314.9.4, debris netting is not required for a scaffold which does not require a design in accordance with Section 3314.3.

**3314.8.1 Guardrail system.** Where required by Section 3314.8, the guardrail system for a scaffold shall meet the requirements of Section 3308.7.1 through 3308.7.7.

**Exceptions:** For the purposes of this section:

1. The term "floor" in Sections 3308.7.1 through 3308.7.7 shall mean "platform."
2. The height of the top rail, as prescribed in Section 3308.7.2, may be as low as 38 inches (965 mm)



in a guardrail system utilized in connection with a scaffold, and such toprail may deflect to a height of not less than 38 inches (965 mm) when designed in accordance with Exception 1 to Section 3308.7.3.

3. Alternate guardrail systems under Exception 1 to Section 3308.7.3 may be designed by the designer of the scaffold or the manufacturer of the scaffold to be capable of withstanding, without failure a force of at least:

- 3.1. For toprails or equivalent members, a force applied in any downward or horizontal direction at any point along its top edge of at least 100 pounds (445 n) for guardrail systems installed on single-point adjustable suspended scaffolds or two-point adjustable suspended scaffolds, and at least 200 pounds (890 n) for guardrail systems installed on all other scaffolds.

- 3.2. For midrails, screens, mesh, intermediate vertical members, solid panels, or equivalent members, a force applied in any downward or horizontal direction at any point along the midrail or other member of at least 75 pounds (333 n) for guardrail systems with a minimum 100 pound (445 n) toprail capacity, and at least 150 pounds (666 n) for guardrail systems with a minimum 200 pound (890 n) toprail capacity.

- 3.3. For toeboards, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard.

4. When intermediate supports, such as ballisters or additional rails are used, they shall not be more than 19 inches (483 mm) apart.

**3314.8.2 Debris netting.** Where required by Section 3314.8, the scaffold shall be enclosed with a debris netting consisting of a wire screen comprised of not less than number 18 gage wire mesh, or equivalent synthetic netting that is flame retardant in accordance with NFPA 701, with openings in the wire or synthetic mesh no larger than  $\frac{1}{2}$  inch (13 mm). Such netting shall be securely attached to the scaffold and shall enclose all open sides, ends, and bottom of the scaffold for the full height of all platform levels where work is occurring, or when on the upper level of a supported scaffold or when on a suspended scaffold, to the height of the toprail. The effect of wind on the netting shall be accounted for in the design of the scaffold, where such design is required by Section 3314.3.

**Exception:** Netting is not required to protect the bottom of the scaffold platform provided the netting is securely fastened to the scaffold deck and the scaffold platform planks are laid tight or the deck of the scaffold is solid.

**3314.9 Supported scaffold.** Supported scaffolds shall meet the requirements of Sections 3314.9.1 through 3314.9.4:

**3314.9.1 Height-to-base ratio.** A supported scaffold with a height-to-base ratio (including outriggers supports, if used) of more than four to one (4:1) shall be restrained from tipping by guying, tying, bracing or equivalent means as follows:

1. Guys, ties or braces shall be installed at locations where horizontal members support both inner and outer legs.
2. Guys, ties, or braces shall be installed according to the manufacturer's recommendations, or as designed in accordance with Section 3314.3, or at a minimum, the first guy, tie or brace shall be installed at a horizontal member and not more than a distance 4 times the least plan dimension from the base support and be repeated vertically at locations of horizontal members every 20 feet (6096 mm) or less thereafter for scaffolds 3 feet (914 mm) wide or less and every 26 feet (7925 mm) or less thereafter for scaffolds greater than 3 feet (914 mm) wide. The top guy, tie, or brace shall be placed no further than four times the least plan dimension from the top. Such guys, ties, or braces shall be installed at each end of the scaffold and at horizontal intervals not to exceed 30 feet (9144 mm) measured from one end (not both) towards each other.
3. Guys, ties, braces, or outriggers shall be used to prevent tipping of supported scaffolds in all circumstances where an eccentric load, such as a cantilevered work platform, is applied or is transmitted to the scaffold.

**3314.9.2 Foundation.** Supported scaffold poles, legs, posts, frames and uprights shall bear on base plates and mud sills or other adequate firm foundation to distribute the weight of the scaffold into the ground, structure, or sidewalk shed upon which it rests.

**3314.9.3 Plumb.** Supported scaffold poles, legs, posts, frames, and uprights shall be plumb and braced to prevent swaying and displacement. The tolerance shall not exceed L/100, where L is the distance measured from the ground or grade elevation to the first X-brace or bottom of the first bearer or frame horizontal member.

**3314.9.4 Supported scaffolds at the edge.** Supported scaffolds located on a floor, working deck, or roof and located within a distance from the edge of the roof or an unenclosed perimeter that is equal to or less than 1.5 times the height of the scaffold shall:

1. Be positively anchored or tied back, and with all wheels or rollers secured by rope, cable, or chocking at the wheels in order to prevent movement; and
2. Have all sides of the scaffold facing an unenclosed perimeter or the edge of a roof within a distance that is equal to or less than 1.5 times the height of the scaffold provided with guardrails and debris netting in accordance with Section 3314.8; or
3. Have all material and equipment susceptible to dislodgement, and not being actively held by a person,

secured in a manner to prevent dislodgement by wind or accidental impact.

**Exception:** The above requirements shall not apply where vertical safety netting that meets the requirements of Section 3308.5, or an approved alternate system, extends to cover the full height and width of all unenclosed perimeters within a distance from the scaffold equal to or less than 1.5 times the height of the scaffold.

**3314.10 Suspended scaffold.** Suspended scaffolds shall meet the requirements of Sections 3314.10.1 through 3314.10.11.

**3314.10.1 Suspended elements to be kept vertical and parallel.** Suspended scaffolds shall be installed and used in such a manner that the ropes or similar suspension elements are vertical and/or in a plane parallel to the wall at all times.

**Exception:** Ropes or similar suspension elements do not have to be vertical and/or in a plane parallel to the wall provided such occurs in accordance with design drawings prepared by a registered design professional. Such design drawings shall be based on an investigation of the support surface and anchorage of the scaffold conducted by such registered design professional. A signed, sealed, and dated report prepared by the registered design professional documenting such investigation shall accompany the design drawings.

**3314.10.2 Support.** All suspended scaffold support devices, such as outrigger beams, C-hooks, parapet clamps, and similar devices shall be supported by surfaces capable of supporting at least 4 times the load imposed on them by the scaffold operating at the rated load of the hoist. The support shall be inspected prior to installation in accordance with the requirements of Section 3314.4.3.1.

**3314.10.3 Outrigger beam location.** Outrigger beams shall be placed perpendicular to the face of the building or structure.

**Exception:** Where a licensed rigger or registered design professional can demonstrate to the commissioner's satisfaction that it is not possible to place an outrigger beam perpendicular to the face of the building or structure, the outrigger beam may be placed at a different angle, provided opposing angle tiebacks are used.

**3314.10.4 Outrigger beam stabilization.** The inboard ends of the suspended scaffold outrigger beam shall be stabilized by bolts or other direct connections to the floor or roof deck, or they shall have their inboard ends stabilized by counterweights.

**Exception:** Multipoint adjustable suspended scaffolds shall not be stabilized by counterweights.

**3314.10.5 Outrigger beam installation.** Outrigger beams shall be installed with all bearing supports perpendicular to the beam centerline and shall set and maintain the web in a vertical position. The shackle or clevis with which the rope is attached to the outrigger beam shall be placed directly over the centerline of the stirrup.

**3314.10.6 Counterweight material.** Counterweights shall be made of a nonflowable material. Sand, gravel and similar materials that can be easily dislocated shall not be used.

**3314.10.7 Counterweight securement.** Counterweights shall be secured by mechanical means to the outrigger to prevent accidental dislodgment.

**3314.10.8 Counterweight removal.** Counterweights shall not be removed from an outrigger beam until the scaffold is disassembled.

**3314.10.9 Horizontal tieback location.** Horizontal tiebacks shall be installed perpendicular to the face of the building or structure, or opposing angle tiebacks shall be installed. Single tiebacks installed at an angle are prohibited.

**3314.10.10 Support devices.** Suspended scaffold support devices, such as C-hooks, cornice hooks, roof hooks, roof irons, parapet clamps or other similar devices shall meet the following requirements:

1. Support devices shall be made of steel, wrought iron or materials of equivalent strength.
2. Such devices shall be supported by bearing blocks.
3. Support devices shall be secured against movement by tiebacks installed perpendicular to the face of the building or structure or by opposing angle tiebacks installed and secured to a structurally sound point of anchorage as prescribed in Section 3314.6.
4. Tieback rope shall be at least equal in strength to the suspension rope.

**3314.10.11 Securing suspended scaffolds.** At the end of the shift, the suspended scaffold shall be cleared of all equipment and material susceptible to dislodgement and shall be lowered to the street or deck of the sidewalk shed, or shall be secured to the roof or building in accordance with design drawings required by Section 3314.3.3.

**3314.11 Suspension rope.** When winding drum hoists are used on a suspended scaffold, they shall contain not fewer than four wraps of the suspension rope at the lowest point of scaffold travel. When other types of hoists are used, the suspension ropes shall be long enough to allow the scaffold to be lowered to the level below without the rope end passing through the hoist, or the rope end shall be configured or provided with means to prevent the end from passing through the hoist.

**3314.11.1 Repaired rope.** The use of repaired wire rope as suspension rope is prohibited.

**3314.11.2 Rope replacement.** Ropes shall be replaced or removed if any of the following conditions exist, and as otherwise prescribed by rule of the department:

1. Any physical damage that impairs the function and strength of the rope.
2. Presence of kinks that might impair the tracking or wrapping of the rope around the drums or sheaves.
3. Presence of abrasion, corrosion, scrubbing, flattening or peening causing the loss of more than one-third of the original diameter of the outside wires.

4. Heat damage caused by a torch or any damage caused by contact with electrical wires.
5. Evidence that the secondary brake has been activated during an overspeed condition and has engaged the suspension rope.

**3314.11.3 Shielding.** Suspension ropes shall be shielded from heat-producing processes.

**3314.11.4 Corrosive substances.** When acids or other corrosive substances are used on a scaffold, the ropes shall be shielded, treated to protect against corrosive substances, or made of a material that will not be damaged by the corrosive substance being used.

**3314.11.5 Suspended scaffold welding precautions for arcing prevention.** Precautions shall be taken to prevent the possibility of arcing through the suspension wire rope during welding operations.

**3314.11.5.1 Insulated thimble.** An insulated thimble shall be used to attach each suspension wire rope to its hanging support. Excessive suspension wire rope and any additional independent lines from grounding shall be insulated.

**3314.11.5.2 Insulating material.** The suspension wire rope shall be covered with insulating material extending at least 4 feet (1219 mm) above the hoist. If there is a tail line below the hoist, it shall be insulated to prevent contact with the platform. The portion of the tail line that hangs free below the scaffold shall be guided or retained or both so that it does not become grounded.

**3314.11.5.3 Protective covers.** Each hoist shall be covered with insulated protective covers.

**3314.11.5.4 Grounding conductor.** In addition to a work lead attachment required by the welding process,

a grounding conductor shall be connected from the scaffold to the structure. The size of the connector shall be at least the size of the welding process work lead, and this conductor shall not be in series with the welding process or the work piece.

**3314.11.5.5 Disconnected grounding lead.** If the scaffold grounding lead is disconnected at any time, the welding machine shall be shut off or the welding lead shall be removed from the scaffold.

**3314.11.5.6 Welding rod or lead.** An active welding rod or uninsulated welding lead shall not be allowed to make contact with the scaffold or its suspension system.

**3314.11.6 Wire rope clips.** When wire clips are used on suspended scaffolds there shall be a minimum of three wire rope clips installed a minimum of six rope diameters apart. The clips shall be retightened to the manufacturer's specifications after initial loading. U-bolt clips shall not be used at the point of suspension. When U-bolt clips are used, the U-bolt shall be placed over the dead end of the rope and the saddle shall be placed over the live end of the rope.

**3314.12 Wood pole scaffolds.** Wood pole scaffolds shall meet the requirements of Sections 3314.12.1 through 3314.12.9.

**3314.12.1 Standard designs.** All wood pole scaffolds 40 feet (12 192 mm) high or less shall be constructed in accordance with the minimum nominal sizes and maximum spacings shown in Tables 3314.12.1 (1) through 3314.12.1 (6). Wood pole scaffolds more than 40 feet (12 192 mm) high shall be designed in accordance with Section 3314.3.

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**TABLE 3314.12.1(2)**  
**MINIMUM SIZE AND MAXIMUM SPACING OF MEMBERS OF SINGLE WOOD POLE MEDIUM DUTY SCAFFOLDS**

UNIFORMLY DISTRIBUTED LOAD NOT TO EXCEED 50 psf					
Max. height of scaffold	20'	40'	60'	75'	
Poles or uprights (minimum)	3" × 4" or 2" × 6"	4" × 4"	4" × 6"	Top 60' 4" × 4"	Lower Sect. 4" × 6"
Pole foundation (minimum)	2" × 9"				
Max. pole spacing (longitudinal)	8'-0"				
Max. width of scaffold	5'-0"			8'-0"	
Bearers or putlogs (minimum)	3" × 4" or 2" × 6" (on edge)			3" × 5" or 2" × 9" (on edge)	
Max. spacing of bearers or putlogs	8'-0"				
Ledgers (minimum)	2" × 9" (on edge)				
Vertical spacing of ledgers (maximum)	7" × 0"				
Nonsupporting stringers	1" × 6" or 1¼" × 4"				
Tie-ins	1" × 6"				
Bracing	1" × 6"				
Planking					
Not more than 6' span	1¼" × 9"				
Up to 8' span	2" × 9"				
Toeboards	2" × 9"				
Guardrails	2" × 4"				

Note: For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.88 Pa.

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**TABLE 3314.12.1(4)**  
**MINIMUM SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT WOOD POLE LIGHT DUTY SCAFFOLDS**

UNIFORMLY DISTRIBUTED LOAD NOT TO EXCEED 25 psf					
Max. height of scaffold (ft)	20'	40'	60'	75'	
Poles or uprights (minimum)	2" × 4"	3" × 4" or 2" × 6"	4" × 4"	Top 60' 4" × 4"	Lower Sect. 4" × 6"
Pole foundation (minimum)	2" × 9"				
Max. pole spacing (longitudinal)					
With 1 1/4" × 9" ledgers	6'-0"				
With 2" × 9" ledgers	10'-0"				
Max. pole spacing (transverse)	10'-0" <sup>a</sup>				
Ledgers (minimum)	1 1/4" × 9" (on edge) or 2" × 9"				
Vertical spacing of ledgers (maximum)	7'-0"				
Bearers (minimum)	1 1/4" × 9" (on edge)				
Nonsupporting stringers	1" × 4"				
Bracing	1" × 4"				
Planking					
Not more than 6' span	1 1/4" × 9"				
Up to 8' span	2" × 9"				
Toeboards	1" × 6"				
Guardrails	2" × 4"				

Note: For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.88 Pa.

a. Total base dimension in both directions to be at least 25 percent  $\frac{1}{4}$  of height.

**TABLE 3314.12.1(5)**

UNIFORMLY DISTRIBUTED LOAD NOT TO EXCEED 50 psf					
Max. height of scaffold (ft)	20'	40'	60'	75'	
Poles or uprights (minimum)	3" × 4" or 2" × 6"	4" × 4"	4" × 6"	Top 60' 4" × 6"	Lower Sect. 6" × 6"
Pole foundation (minimum)	2" × 9"				
Max. pole spacing (longitudinal)	8'-0"				
Max. pole spacing (transverse)	10'-0" <sup>a</sup>				
Ledgers (minimum)	2" × 9" (on edge)				
Vertical spacing of ledgers (maximum)	6'-0"				
Bearers (minimum)	2" × 9" (on edge)				
Nonsupporting stringers	1 1/4" × 4" or 1" × 6"				
Bracing	1" × 6"				
Planking					
Not more than 6' span	1 1/4" × 9"				
Up to 6' span	2" × 9"				
Toeboards	2" × 9"				
Guardrails	2" × 4"				

a. Total base dimension in both directions to be at least 25 percent<sup>†</sup> of height.



**TABLE 3314.12.1(6)**  
**MINIMUM SIZE AND MAXIMUM SPACING OF MEMBERS OF INDEPENDENT WOOD POLE HEAVY DUTY SCAFFOLDS**

UNIFORMLY DISTRIBUTED LOAD NOT TO EXCEED 75 psf					
Max. height of scaffold (ft)	20'	40'	60'	75'	
Poles or uprights (minimum)	4" × 4"	4" × 4"	4" × 6"	Top 60' 4" × 6"	Lower Sect. 6" × 6"
Pole foundation (minimum)	2" × 9"				
Max. pole spacing (longitudinal)	6'-0" <sup>a</sup>				
Max. pole spacing (transverse)	10'-0" <sup>a</sup>				
Ledgers (minimum)	2" × 9" (on edge)				
Vertical spacing of ledgers (maximum)	5'-0"				
Bearers (minimum)	2" × 9" (on edge)				
Nonsupporting stringers	1 1/4" × 9"				
Bracing	1" × 6"				
Planking	2" × 9"				
Toeboards	2" × 9"				
Guardrails	2" × 4"				

Note: For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 47.88 Pa.

a. Total base dimension in both directions to be at least 25 percent $\frac{1}{4}$  of height.

**3314.12.2 Erection and removal.** When a new working level is desired, the existing planks shall be left undisturbed until the new working level is framed. As the platform level is abandoned with the progress of the work, all members other than the planking, railing and toeboards shall be left intact. When removing a scaffold, the sequence of removing the members shall be the reverse of that used in erection.

**3314.12.3 Materials and construction for wood pole scaffolds.** Wood pole scaffold materials and construction shall comply with the following requirements:

1. All lumber used in wood pole scaffolds or their supports shall be at least equal in strength and quality to construction grade lumber in accordance with Section 2301.

2. All lumber and timber shall be fastened at the various joints with sufficient nails or bolts of a suitable size to produce a secure joint capable of withstanding the design load. Table 3314.12.3 provides minimum requirements for size and number of nails. All nails shall be driven full length.
3. Any other suitable material, or dimensions other than those indicated, may be used for wood pole scaffold construction provided it is at least equivalent in strength and suitability to the comparable wood scaffold it is designed to replace, and approval of the commissioner has been obtained.

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loads as defined in Section 3302.1, unless the design provisions of Section 3314.3 have been met.

**3314.14 Outrigger scaffolds (thrust out).** Outrigger scaffolds (thrust out) shall not be used for loading in excess of 50 pounds per square foot (244.1 kg/m<sup>2</sup>) (medium duty).

**3314.14.1 Outrigger beams.** The fulcrum point of the beam shall rest on a secure bearing at least 6 inches (152 mm) in each horizontal dimension. The beam shall be secured against movement and shall be securely braced against tipping at both the fulcrum point and the inboard end.

**3314.14.2 Inboard supports.** The inboard ends of outrigger beams shall be securely fixed to resist all vertical, horizontal and torsional forces. Pull-out tests for adhesive and expansions anchors, if used, shall be approved by the commissioner.

**3314.15 Two-point adjustable suspended scaffolds.** Two-point adjustable suspended scaffolds shall meet the requirements of Sections 3314.15.1 through 3314.15.7.

**3314.15.1 Width and support.** Two-point adjustable suspended platforms shall be at least 20 inches (508 mm) but not more than 36 inches (914 mm) in width unless designed by a registered design professional. Each end of the platform shall be supported by a stirrup or hanger that meets the requirements of Section 3315.15.2, and the platform shall be securely fastened thereto. Not more than two hangers or stirrups shall be used to support one scaffold.

**3314.15.2 Hangers or stirrups.** Hangers or stirrups shall be of steel or wrought iron. Each such hanger shall be formed to properly fit the platform and the hoist mechanism. The hanger or stirrup shall be placed at least 6 inches (152 mm) but not more than 18 inches (457 mm) from the end of the platform unless the manufacturer specifies otherwise.

**3314.15.3 Fiber suspension rope.** The use of fiber rope shall be limited to light duty two-point adjustable suspended scaffolds. Fiber rope shall be at least equivalent in strength and suitability to  $\frac{3}{4}$ -inch (19 mm) grade #1 unspliced manila rope.

**3314.15.3.1 Corrosive substances.** Fiber rope susceptible to damage from corrosive substances shall not be permitted for or near any work involving the use of corrosive substances.

**3314.15.3.2 Upper block.** Fiber rope shall not be used where the upper block is more than 100 feet (30 480 mm) or ten stories above the ground or roof setback.

**3314.15.3.3 Fit.** All blocks shall fit the size of rope they carry, and shall be constructed so as not to chafe the rope.

**3314.15.4 Combination.** Two or more two-point adjustable suspended scaffolds shall not be combined into one by bridging the distance between them or by any other form of connection.

**3314.15.5 Number of workers.** Not more than two workers shall be permitted to work on one scaffold at one time except where the scaffold is designed to hold more. Writ-

ten permission from the commissioner shall be required for more than two workers on the scaffold.

**3314.15.6 Device to raise, lower, and hold the scaffold.** Every two-point adjustable suspended scaffold shall be equipped with a device to raise, lower or hold the scaffold in position.

**3314.15.7 Platforms.** The platforms of every two-point adjustable suspended scaffold shall be ladder-type, plank-type, beam-type, light-metal type, or another type acceptable to the commissioner.

**3314.16 Corner and angle scaffolds.** Corner and angle scaffolds shall comply with the requirements of Sections 3314.16.1 through 3314.16.4.

**3314.16.1 Motors.** As many motors as needed shall be provided to maintain the stability of the platform under all operating conditions.

**3314.16.2 Maximum number of people.** The number of people allowed on a corner or angle scaffold shall not be more than the number of motors required to keep the scaffold stable, unless otherwise designed by a registered design professional.

**3314.16.3 Additional information.** In addition to the information required by Section 3314.3, corner and angle scaffolds shall also contain load capacity and distribution charts and a certification from the registered design professional that he/she has reviewed the manufacturer's design calculations and testing or prepared sufficient calculations of his/her own and found them to conform to this code.

**3314.16.4 Inspection.** The equipment setting for corner and angle scaffolds shall be inspected by the department prior to its use. Additional inspection by the department shall be required each time the equipment is moved to a different position.

**3314.17 Multiple-point adjustable suspended scaffolds.** Multiple-point adjustable suspended scaffolds shall comply with the following:

1. All multiple-point adjustable suspended scaffolds shall be supported by wire ropes. The use of fiber ropes is not permitted;
2. Provision shall be made to prevent supports from slipping off the ends of outrigger beams;
3. Platform bearers shall be of metal; and
4. During raising or lowering, the levels of the various sections of the scaffolds shall be kept uniform and the differential height between sections shall be minimized.

**3314.18 Manually propelled, free-standing scaffolds.** All manually propelled free-standing scaffolds shall meet the following requirements:

1. Work platforms shall be tightly planked for the full width of the scaffold, except for necessary entrance openings. Planks shall be secured in place;
2. Platforms shall have a guardrail system;
3. Where a ladder is used to approach a platform, the ladder shall be secured to the scaffold;

4. Handholds shall be provided for safe passage from the ladder to the platform;
5. Unless temporarily braced to an adjacent structure, the ratio of the platform height to the least base dimension shall be such as to assure stability, but in no case shall such height be more than four times the least base dimension;
6. Provisions shall be made to prevent the scaffold from falling during movement from one location to another;
7. While the scaffold is in use, it shall rest upon a stable footing and shall stand plumb. The casters or wheels shall be locked in position; and
8. While the scaffold is being moved, no person shall be permitted to ride on it, and all tools, equipment and material shall be removed.

**3314.19 Mast climber.** Mast climbers shall be designed, constructed, permitted, installed, adjusted, maintained, repaired, used, operated, inspected, and removed in accordance with rules promulgated by the commissioner.

## SECTION BC 3315 STRUCTURAL RAMPS, RUNWAYS AND PLATFORMS

**3315.1 Ramps and runways.** Ramps and runways (including elevated walkways) shall comply with the requirements of Sections 3315.1.1 through 3315.1.6.

**3315.1.1 Construction.** All runways and ramps shall be constructed, braced and supported to resist lateral displacement and all vertical loads, including impact.

**3315.1.2 For motor vehicle use.** Runways and ramps for the use of motor vehicles may consist of an earthfill or may be structurally supported. Such runways and ramps shall have a clear width of not less than 12 feet (3658 mm) with timber curbs at least 8 inches by 8 inches (203 mm by 203 mm) placed parallel to, and secured to, the sides of the runway or ramp. The flooring of structurally supported ramps shall consist of no smaller than 3 inch (76 mm) planking full size, undressed, or equivalent material, with spans designed for the loads to be imposed.

**3315.1.3 For use of workers.** Runways and ramps for the use of workers shall be at least 1 foot 6 inches (457 mm) in clear width. Where used for wheelbarrows, handcarts, or hand-trucks, runways and ramps shall be at least 3 feet (914 mm) in clear width. Flooring shall consist of at least 2-inch (51 mm) planking spanning as permitted by Table 3314.5.2, laid close, butt-joined and securely fastened.

**3315.1.4 Slope limitations.** Ramps shall have a slope not steeper than one in four. If the slope is steeper than one in eight, the ramp shall be provided with cleats spaced not more than 14 inches (356 mm) apart and securely fastened to the planking to afford a foothold. Spaces in the cleats may be provided for the passage of the wheels of vehicles. The total rise of a continuous ramp used by

workers carrying material or using wheelbarrows, handcarts, or hand-trucks shall not exceed 12 feet (3658 mm) unless broken by horizontal landings at least 4 feet (1219 mm) in length.

**3315.1.5 Guardrail required.** A guardrail meeting the requirements of Section 3308.7.1 through Section 3308.7.7 shall be provided:

1. On all edges of the runway or ramp that are located more than 5 feet (1524 mm) above the ground or floor; and
2. Along any portion of the runway or ramp that abuts motor vehicle traffic.

For the purposes of this section, the term “floor” in Sections 3308.7.1 through 3308.7.7 shall mean “runway or ramp.”

**3315.1.6 Netting required.** Where it is possible for the public to pass under, or next to, runways or ramps, the space between the top rail and the toeboard shall be enclosed with a wire screen composed of not less than No. 18 steel wire gage, or equivalent synthetic netting that is flame retardant in accordance with NFPA 701, with openings in the wire or synthetic mesh no larger than 1/2 inch (13 mm).

**3315.2 Platforms.** Platforms shall comply with the requirements of Sections 3315.2.1 through 3315.2.3.

**3315.2.1 Planking.** Platforms used as working areas, or for the unloading of wheelbarrows, hand-trucks, or carts shall have a floor consisting of at least 2-inch (51 mm) planking spanning as permitted by Table 3314.5.2. Platforms for the use of motor trucks shall have a floor of at least 3-inch (76 mm) planking, full size, undressed or equivalent materials with spans designed for the loads to be imposed. Planking shall be laid close and shall be butt-joined and securely fastened.

**3315.2.2 Guardrail required.** A guardrail meeting the requirements of Section 3308.7.1 through Section 3308.7.7 shall be provided on all open sides of platforms located more than 5 feet (1524 mm) above the ground or floor. For the purposes of this section the term “floor” in Sections 3308.7.1 through 3308.7.7 shall mean “platform.”

**Exception:** In lieu of a guardrail, the side of the platform used for the loading or unloading of vehicles may be protected by a timber curb at least 8 inches by 8 inches (203 mm by 203 mm) for motor trucks or 4 inches by 4 inches (102 mm by 102 mm) for wheelbarrows and hand-trucks.

**3315.2.3 Netting required.** Where it is possible for the public to pass under, or next to, platforms, the space between the top rail and the toeboard shall be enclosed with a wire screen composed of not less than No. 18 steel wire gage, or equivalent synthetic netting that is flame retardant in accordance with NFPA 701, with openings in the wire or synthetic mesh no larger than 1/2 inch (13 mm).



**3315.3 Special requirements where power buggies are used.** Runways, ramps, platforms, and other surfaces upon which power buggies are operated shall meet the following minimum requirements:

1. They shall be designed by a qualified person.
2. They shall be able to sustain, without failure, at least four times the maximum live load for which they are intended.
3. The minimum width, inside of curbs, for any ramp, runway, or platform shall be 2 feet (610 mm) wider than the outside width of any power buggy operated thereon without passing, and 3 feet (914 mm) wider than twice such buggy width in the places where passing occurs.
4. All runways shall be essentially level transversely.
5. Curbs shall be furnished along all buggy traffic paths that are nearer than 10 feet (3048 mm) horizontally to any unenclosed area, shaft, or other open space into which or through which a fall of more than 12 inches (305 mm) from such surface is possible, except as set forth in numbered Item 7.
6. Where curbs are not required because the buggy is operated on a surface not over 12 inches (305 mm) above another surface, the lower surface shall be strong enough to sustain the loaded vehicle in the event of a fall thereon.
7. Curbs may be omitted at actual dumping points more than 12 inches (305 mm) above other surfaces if the edge over which dumping occurs is provided with bumpers or other means that will effectively stop the buggy from running over the edge while dumping.
8. Curbs must be at least 7 inches (178 mm) high, securely fastened, and capable of resisting side impact, and shall be equivalent to at least 2 inch by 8 inch (51 mm by 203 mm) plank set on edge against uprights securely fastened and braced at not more than 4-foot (1219 mm) intervals.

## SECTION BC 3316 HOISTING EQUIPMENT

**3316.1 Scope.** Hoisting equipment shall meet and be used in accordance with the requirements of this section. Material hoists and bucket hoists shall also meet the requirements of Section 3317, personnel hoists shall also meet the requirements of Section 3318, and cranes and derricks shall also meet the requirements of Section 3319.

**3316.2 Requirements.** Hoisting equipment, its supports and runback structures shall be installed, operated, and maintained to eliminate hazard to the public or to property. It shall be unlawful to operate any such equipment that is not provided with a positive means for preventing the unauthorized operation of such machine. The means whereby such machines may be made inoperative shall be accepted by the department.

**3316.3 Notification of hoisting accidents.** The owner or person directly in charge of any hoisting equipment shall immediately notify the commissioner following any accident involving hoisting equipment. Following an incident, no person shall permit either of the following, without the permission of the commissioner:

1. Use of such hoisting equipment; or
2. Removal of the hoisting equipment or any part thereof from the area of the job site.

**3316.4 Permit.** Permits for hoisting equipment shall comply with the requirements of Sections 3316.4.1 through 3316.4.5.

**3316.4.1 Acceptance of equipment.** Hoists and all pre-manufactured runback structures shall be approved for use by the commissioner or other agency acceptable to the commissioner

**Exception:** Cranes and derricks shall meet the requirements of Section 3319.3.

**3316.4.2 Posting of permits.** Permits, or duplicates of the permits, shall be posted in a conspicuous location in the car or on the equipment.

**3316.4.3 Construction documents.** Copies of the written permit application and approved construction documents shall be kept at the site and made available to the commissioner upon request.

**3316.4.4 Permit signage.** Following the receipt of a permit to install a hoist, the permit holder shall post a sign that meets the requirements of Section 3301.9.6. Such sign shall be clearly visible from the street.

**3316.4.5 Other temporary signage.** Other than as specified in Section 3301.10, there shall be no information, pictorial representation, or any business or advertising messages posted on the hoisting equipment or runback structure.

**3316.5 Design, construction and inspection.** Hoisting equipment, its supports and runback structures shall be designed, constructed and inspected in accordance with rules promulgated by the commissioner.

**3316.6 Rope inspection and replacement.** All ropes used in hoisting equipment shall meet the inspection and replacement requirements specified in rules promulgated by the commissioner.

**3316.7 Operation.** Only operators designated by the person causing such hoisting equipment to be used shall operate such hoisting machinery. Operators and signalmen/signalwomen shall be qualified for the operation they perform. The operator shall be responsible for making the machine inoperative before he or she leaves the machine.

**3316.7.1 Use.** Hoisting equipment, its supports and runback structures shall be operated in compliance with the manufacturing specifications, the requirements of this code, and rules promulgated by the commissioner. If there is a discrepancy, the stricter requirement shall be met.

**3316.7.2 Use during installation, jumping, dismantling or alteration.** Personnel and building materials connected with or related to the building project shall not be moved by the hoist while it is being installed, jumped, dismantled or altered.

**3316.8 Maintenance.** Hoisting equipment, its supports and runback structures shall be maintained in compliance with the manufacturing specifications and rules promulgated by the commissioner. If there is a discrepancy, the stricter requirement shall be met.

**3316.9 Rigging.** The attachment and detachment of articles from hoisting equipment used to hoist or lower articles on the outside of a building shall be in accordance with the requirements of Sections 3316.9.1 through 3316.9.3.

**3316.9.1 Supervision.** The hoisting or lowering of any article on the outside of any building in the city shall be performed by or under the direct and continuing supervision of a licensed rigger.

**Exceptions:**

1. In lieu of a licensed rigger, the hoisting or lowering of a sign may be performed by or under the direct and continuing supervision of a licensed sign hanger.
2. Suspended scaffold operations shall meet the requirements of Section 3314.
3. In lieu of a licensed rigger, the hoisting or lowering of articles on the outside of a building may be performed by or under the supervision of a competent person designated by the contractor using the equipment provided the following conditions are met:
  - 3.1. The hoisting or lowering occurs in conjunction with:
    - 3.1.1. The construction of a new building;
    - 3.1.2. The full demolition of an existing building;
    - 3.1.3. The vertical or horizontal enlargement of an existing building; or
    - 3.1.4. The alteration, maintenance, or repair of a façade of a major building where a site safety plan is required by Section 3310.3.
  - 3.2. All individuals involved in the work are certified or trained in accordance with Section 3316.9.2, where such certification or training is required;
  - 3.3. The hoisting or lowering does not meet the definition of industrial rope access;
  - 3.4. The article being hoisted or lowered is not a boiler or tank;

3.5. The article being hoisted or lowered is not related to the assembly, jumping, or disassembly of a tower or climber crane; and

3.6. Where the hoisting or lowering meets the definition of a critical pick, such critical pick is:

3.6.1. Performed in accordance with a plan developed by either a:

3.6.1.1. Licensed master rigger; or

3.6.1.2. Registered design professional who has demonstrated knowledge or experience with safe loads and computation thereof, types of rigging, size and strength of ropes, cables, blocks, and any other rigging equipment to be used during the critical pick; and

3.6.2. Immediately prior to the pick, onsite verification is made to ensure conformance with the plan by either:

3.6.2.1. The licensed master rigger who developed the plan;

3.6.2.2. The registered design professional who developed the plan; or

3.6.2.3. A registered design professional employed by and working under the direct supervision of the registered design professional who developed the plan.

4. Where the hoisting or lowering is performed under the direct and continuing supervision of a licensed rigger, a specialty crew who is not in the direct employ of the licensee or business of the licensee may be utilized, provided:

4.1. The work requires a specialty trade, including but not limited to work with hazardous materials or chemicals;

4.2. The crew is in accordance with rules promulgated by the commissioner; and

4.3. The members of the crew are approved by the commissioner.

**3316.9.1.1 Supervisor.** The individual supervising the hoisting or lowering in accordance with Section 3316.9.1 shall:

1. Be present at the site during all times articles are being attached or detached;
2. Have the ability to communicate with all individuals involved with such work; and

3. Be in the line of sight of either the:

- 3.1. Attaching operation;
- 3.2. Detaching operation, or
- 3.3. The hoisting equipment.

**3316.9.2 Certification or training.** All individuals who attach or detach articles from the hook of hoisting equipment in conjunction with the hoisting or lowering of an article outside of a building, the supervisor of such individuals, and signalpersons communicating with such individuals, shall, eighteen months after the effective date of this section, either:

1. Possess a valid certification for both rigging and signaling from an organization acceptable to the commissioner and accredited by the National Commission for Certifying Agencies (NCCA) or the American National Standards Institute (ANSI). The certification shall be valid for a term of no more than five years before it has to be renewed and shall cover areas including, but not limited to, the inspection and use of rigging hardware, basic rigging techniques, signaling, and hazards associated with rigging. The certification for a supervisor shall, in addition to the foregoing, include calculations and problem solving with respect to rigging; or
2. Have completed an initial department-approved training course, and four years following the completion of the initial training course, and every four years thereafter, complete a department-approved refresher course. The courses shall be in accordance with the following:
  - 2.1. The initial training course for individuals who attach or detach articles from the hook of hoisting equipment and signalpersons communicating with such shall be, at a minimum, 16 hours long, with the refresher course, at a minimum, 8 hours long. The initial training course for a supervisor shall be, at a minimum, 32 hours long, with the refresher course, at a minimum, 16 hours long.
  - 2.2. The training course shall be conducted by a registered New York State Department of Labor apprenticeship training program or by an educational institution or school chartered, licensed or registered by the New York State Department of Education or by a provider approved by the department and presented by an instructor acceptable to the commissioner.
  - 2.3. Training courses and refresher courses shall cover areas including, but not limited to, the inspection and use of rigging hardware, basic rigging techniques, signaling, and hazards associated with rigging. The training course and refresher course for a supervisor shall, in addition to the foregoing, include calculations and problem solving with respect to rigging. The training course and refresher course, both for crew members and supervisors, shall include a significant portion of hands on training.

2.4. Successful completion of the initial training course and refresher course shall be based upon passage of a written and a practical exam.

2.5. Successful completion of the initial training course and refresher course shall be evidenced by a wallet size certificate card issued by the training provider and acceptable to the commissioner. Such certificate card shall be readily available to the commissioner upon request and shall contain, at a minimum, the following information:

- 2.5.1. The name of the individual to whom it was issued;
- 2.5.2. A photograph of the individual to whom it was issued; and
- 2.5.3. Any other information required pursuant to rules promulgated by the commissioner for a department approved training course.

2.6. For individuals who fail to complete the required refresher course within any 4 year period, a refresher course shall be considered timely if completed within 1 year after the expiration date of the last previously completed initial or refresher course. During such period, such individual shall not perform or supervise any activity for which the lapsed training is required to perform or supervise such activity until such individual has successfully completed such refresher course. Where more than 1 year has lapsed, such individual shall be required to successfully recomplete the initial training course.

**Exceptions:** Training or certification is not required for:

1. Individuals working under the direct and continuing supervision of a licensed rigger or sign hanger.
2. The loading or unloading of a material delivery truck provided the material is loaded or unloaded only between the ground and the truck, or vice versa, and also provided that the material is not raised more than 12 feet (3658 mm) above the bed of the truck during the loading or unloading process.
3. The use of hoisting equipment that has a manufacturer's rated capacity of 2,000 pounds (907 kg) or less.

**3316.9.3 Industrial rope access.** Any person using industrial rope access methods to descend or ascend outside a building, including the individual supervising such, must be certified by either the Society of Professional Rope Access Technicians ("SPRAT") or the Industrial Rope Access Trade Association ("IRATA"), or an equivalent acceptable to the department. Only hand tools, securely attached to a person, may be carried by such person during the use of industrial rope access methods. Any other tools or equipment must be separately hoisted or lowered.

## SECTION BC 3317 MATERIAL HOISTS AND BUCKET HOISTS

**3317.1 Scope.** Material hoists and bucket hoists shall meet the requirements of this section and Section 3316.

**3317.2 Permit.** The equipment user or his or her designated representative shall obtain a written permit issued by the commissioner on the basis of construction documents, drawings and specifications prior to erecting or installing all power-operated, material hoists, including any runback structure or supports.

**Exception:** Power-operated, nonguided material hoists with a maximum capacity of one ton or less and installed on new construction, or on alterations where the operation of the hoist is confined within the property and the site is protected in accordance with Section 3307.

**3317.3 Design, inspection and operation.** Material hoists, bucket hoists and their components shall be designed, inspected, and operated in accordance with rules promulgated by the commissioner.

**3317.4 Construction.** Material hoists, bucket hoists and their components shall be constructed in compliance with the manufacturing specifications, the requirements of this code, and rules promulgated by the commissioner. If there is a discrepancy, the stricter requirement shall be met.

Upon completion of the installation of the hoisting equipment and/or its runback structure, an inspection report verifying that the hoist has been installed in accordance with the design drawings, construction documents and specifications shall be prepared by the designer, installer or an approved inspection agency designated by both the designer and installer.

**3317.5 Operation.** Notwithstanding any other provision of law, material hoists with a manufacturer's capacity over one ton shall be operated only by persons holding a Class A or B hoisting machine operators license except during installation, jumping, dismantling or alteration operations.

## SECTION BC 3318 PERSONNEL HOISTS

**3318.1 Scope.** Personnel hoists shall meet and be used in accordance with the requirements of this section and Section 3316.

**3318.2 Permit.** The equipment user or his or her designated representative shall obtain a written permit issued by the commissioner on the basis of construction documents, drawings and specifications prior to erecting or installing all power-operated, material hoists, including any runback structure or supports.

**3318.3 Design and inspection.** Personnel hoists and their components shall be designed and inspected in accordance with rules promulgated by the commissioner.

**3318.4 Construction.** Personnel hoists and their components shall be constructed in compliance with the manufacturer's specifications, this code, and rules promulgated by the commissioner. If there is a discrepancy, the stricter requirement shall be met.

Upon completion of the installation of the hoisting equipment and/or its runback structure, an inspection report verifying that the hoist has been installed in accordance with the design drawings, construction documents and specifications shall be prepared by the designer, installer or third-party designated by both the designer and installer and acceptable to the commissioner.

**3318.5 Operation.** Personnel hoists and their components shall be operated in accordance with this code and rules promulgated by the commissioner.

When the hoist is equipped with manual controls, the hoist shall be operated by a competent qualified operator. Only the operator authorized by the equipment user shall operate the hoist.

**3318.5.1 Making safety devices inoperative.** No person shall at any time make any required safety device or electrical protective device inoperative except when necessary during tests, inspections and maintenance.

Immediately upon completion of the tests, inspections and maintenance, such devices shall be restored to their normal operating condition in conformance with the applicable requirements of this section.

## SECTION BC 3319 CRANES AND DERRICKS

**3319.1 Scope.** The construction, installation, inspection, maintenance and use of cranes and derricks shall be in conformance with the requirements of this section, Section 3316, and with rules promulgated by the commissioner.

**3319.2 Operation.** Riggers and hoisting machine operators shall be licensed as required by Chapter 4 of Title 28 of the *Administrative Code*.

**3319.3 Requirements.** No owner or other person shall authorize or permit the operation of any crane or derrick without a certificate of approval, a Certificate of Operation and a Certificate of On-site Inspection.

### Exceptions:

1. The requirements of this section shall not apply to excavating or earth-moving equipment, except cranes used with clamshells.
2. The requirements of this section shall not apply to cranes or derricks performing an emergency use pursuant to the lawful order of the head of any department.
3. The requirements of this section shall not apply to mobile cranes, including jibs and any other extensions to the boom not exceeding 50 feet (15 240 mm) in length and with a manufacturer's rated capacity of 3 tons (2722 kg) or less.
4. The requirements of this section shall not apply to mobile cranes, including jibs and any other extensions, exceeding 50 feet (15 240 mm) but not exceeding 135 feet (41 148 mm) in length, and with a manufacturer's rated capacity of 3 tons (2722 kg) or less, except that a Certificate of Oper-



ation, as provided for in Section 3319.5, shall be required. The requirement for a Certificate of Operation shall not apply to such a crane used exclusively as a man basket. The commissioner may, by rule, exempt other mobile cranes of limited size from any or all requirements of this section.

5. The requirements of this section shall not apply to hoisting machines permanently mounted on the bed of material delivery trucks that are used exclusively for loading and unloading such trucks, provided that the length of boom does not exceed the length of the truck bed by more than 5 feet (1524 mm) and that any material transported thereon shall not be raised more than 2 feet (610 mm) in the unloading process. Operators of such equipment shall be exempt from licensing requirements described in Chapter 4 of Title 28 of the *Administrative Code*.
6. The requirements of this section shall not apply to cranes or derricks used in industrial or commercial plants or yards not used for the construction of the facility. Floating cranes, floating derricks, and cranes and derricks used on floating equipment shall also be exempt from the requirements of this section. Operators of such equipment shall be exempt from the licensing requirements described in Chapter 4 of Title 28 of the *Administrative Code*.
7. The requirements of this section shall not apply to augurs, churn-drills and other drilling equipment not used for hoisting any objects. Operators of such equipment shall be exempt from the licensing requirements described in Chapter 4 of Title 28 of the *Administrative Code*.
8. The requirements of this section shall not apply to derricks having a maximum rated capacity not exceeding 1 ton (907 kg).
9. The requirements of this section shall not apply to mechanic's truck with a hoisting device when used in activities related to the maintenance and repair of construction-related equipment.
10. The requirements of this section shall not apply to articulating boom cranes that do not have an integral hoisting mechanism, and that are used exclusively for loading and unloading of trucks or trailers, provided that the length of boom does not exceed 135 feet (41 148 mm) and that any material transported thereon shall not be raised more than 100 feet (30 480 mm) in the unloading process. Operators of such equipment shall be exempt from licensing requirements described in Chapter 4 of Title 28 of the *Administrative Code*.

**3319.4 Certificate of Approval.** Certificates of Approval shall comply with the following:

1. The manufacturer, owner, or designated representative of a crane or derrick for which a Certificate of

Approval is sought shall file an application for such Certificate of Approval and provide such information as set forth in rules promulgated by the commissioner.

2. Upon the department's approval of the application described in Item 1 above, the department shall issue a Certificate of Approval for the equipment and an approval of the submitted load rating chart.
3. A new Certificate of Approval shall be required when a crane or derrick is modified or altered to increase the boom length, jibs or any extensions to the boom beyond the maximum approval length or when the load ratings are increased.

**3319.5 Certificate of Operation.** Certificates of Operation shall comply with the following:

1. The commissioner shall issue the initial Certificate of Operations for the crane or derrick with Certificate of Approval upon satisfactory inspection and test indicating that such crane or derrick is in a safe operating condition. The initial Certificate of Operation shall expire 1 year from the date of issuance.
2. The owner of a crane or derrick covered by the Certificate of Operation shall renew the Certificate of Operation each year.
3. If the owner of the covered crane or derrick applies for renewal of a certificate of operation within not more than 60 nor less than 30 days prior to the date of its expiration, such owner may continue to use the covered crane or derrick until the department grants or denies a new certificate.
4. When a crane or derrick configuration is changed to increase the boom length, jibs or any extensions to the boom beyond the maximum approval length or when the load ratings are increased, a new Certificate of Operation shall be required. In such a case, the crane or derrick may not be operated until the new Certificate of Operation is obtained.
5. An application for a new certificate of operation shall be submitted when attachments that affect the stability or structure of the crane or derrick are added. Calculations and load rating charts as required by rules promulgated by the commissioner shall be submitted with the renewal request.

**3319.6 Certificate of On-site Inspection.** Certificates of on-site inspection shall comply with the following:

1. The equipment user, or his or her designated representative, shall obtain a Certificate of On-site Inspection for the use of any crane or derrick used for construction or demolition purposes at each job site. Such application for the Certificate of On-site Inspection shall include information set forth in rules promulgated by the commissioner.
2. Upon approval of the application, a copy of such approval shall be given to the applicant. It shall be unlawful to operate the equipment that is the subject of the approval until it has been inspected and found to be satisfactory by the department as set forth in rules pro-

mulgated by the commissioner. Upon inspection and a finding of satisfactory compliance, the approval shall be deemed a Certificate of On-site Inspection, which shall expire one year from the date of issuance. A Certificate of On-site Inspection may be renewed in accordance with rules promulgated by the commissioner.

3. The Certificate of On-site Inspection is valid only if the conditions and statements contained in the approved application are complied with, and the crane or derrick is operated in conformance with the provisions of this section and the rules applicable thereto.
4. A Certificate of On-site Inspection is not required for cranes or derricks performing work exempted from such requirement by rules promulgated by the commissioner.

**3319.7 Temporary certificates.** The commissioner may issue temporary Certificates of Approval, operation and on-site inspection for any crane or derrick during the pendency of an application for Certificates of Approval and operation upon inspection and upon such analysis and testing as the commissioner may deem necessary. The commissioner may revoke such temporary certificates if the application is denied.

**3319.8 Special provisions for tower and climber cranes.** Tower and climber cranes shall comply with the following requirements:

**3319.8.1 Plan for the erection, jumping, climbing, and dismantling of tower or climber cranes.** An erection, jumping, climbing and dismantling plan for tower or climber cranes, other than truck and crawler mounted tower cranes, shall be submitted to the department by a licensed engineer. The plan must be prepared by a licensed engineer in conjunction with a licensed rigger and must be in compliance with the manufacturer's recommendation for erection, jumping, climbing, or dismantling of the specific crane where such manufacturer's recommendations exist. The plan must be filed with the certificate of on-site inspection application as required by Section 3319.3. No erection, jumping, climbing, or dismantling of a tower or climber crane shall take place without the prior issuance of a certificate of on-site inspection by the cranes and derricks unit. The plan shall include the following:

1. Identification of the equipment proposed to be used; including all machines proposed to be used in the erection or dismantling;
2. A detailed identification of the assemblies and components required for the erection and dismantling of the equipment;
3. Location of the equipment, sidewalk sheds (or Department of Transportation street closing permits, if applicable), surrounding buildings, protection for their roofs and the pick-up points, loads, and radius of swing of all loads. In addition, the safe load from the approved load radius chart shall be submitted for lift radius;

4. A weight list of all assemblies and components proposed to be lifted. Components are to be clearly marked with their weight painted on the assembly or stamped on metal tags attached to the assembly. The manufacturer of the climber or tower crane shall certify the weight of assemblies and components. Alternately, in lieu of painted weight markings or metal tags, or when the manufacturer's certification is not available, the licensed engineer applicant shall certify an erection, jumping, climbing or dismantling weight list indicating how such weights were determined;
5. The center of gravity of all asymmetrical components shall be located and shown;
6. A sequence of operation detailing the erection, jumping, climbing, and dismantling, along with the rigging materials to be used in such operations;
7. The certification of the calibration as required in Item 6 of Section 3319.8.8;
8. Cranes or derricks located either within the lot line or on the street and used to erect, jump, climb, or dismantle a tower or climber crane shall be indicated;
9. The names and contact information of the licensed master, climber or tower crane rigger, rigger foreman, and the crane safety coordinator or designee, along with the name and contact information of the company performing the erection, dismantling, climbing and/or jumping work.

**3319.8.2 Safety coordination meeting.** The general contractor must hold a safety coordination meeting prior to the initial erection, as well as the dismantling or initial jump down, of a climber or tower crane. No work related to the erection, climbing, jumping or dismantling of the tower or climber crane may be performed without the safety coordination meeting having taken place. The following parties must be present at the safety coordination meeting:

1. General contractor or designee;
2. Professional engineer of record for the crane or designee;
3. Licensed master, tower or climber crane rigger and rigger foreman;
4. Crane safety coordinator;
5. Site safety manager or coordinator, if required for the job by Chapter 33 of the code;
6. Licensed crane operator and oiler; and
7. Any other parties the department deems necessary.

**3319.8.3 Pre-jump safety meeting.** The general contractor must coordinate a pre-jump safety meeting no more than 24 hours prior to each instance of a tower or climber crane jump or climb. No work related to the jumping or climbing of the tower or climber crane may be performed without the pre-jump safety meeting having taken place.

The following parties must be present at the pre-jump safety meeting:

1. General contractor or designee;
2. Licensed master, tower or climber crane rigger and rigger foreman;
3. Crane safety coordinator;
4. Site safety manager or coordinator, if required for the job by Chapter 33 of the *building code*;
5. Licensed crane operator and oiler;
6. "Jumping" crew and back-up personnel;
7. Flagman/woman where required;
8. Signalman/woman and communications personnel; and
9. Any other parties the department deems necessary.

#### 3319.8.4 Department notification.

**3319.8.4.1 Meeting notifications.** The general contractor must notify the department at least 48 hours in advance of any safety coordination meeting or pre-jump safety meeting. No work related to the erecting, jumping, climbing, or dismantling of the tower or climber crane is to be performed without prior notice of the meeting having been given to the department.

**3319.8.4.2 Time schedule.** A time schedule including date and time of day that the erection, jumping, climbing, or dismantling is proposed to take place shall be provided as soon as it is known by the general contractor.

**3319.8.5 Safety coordination and pre-jump safety meeting topics.** The following topics are to be covered during safety coordination and pre-jump safety meetings:

1. Scope of work;
2. Roles and responsibilities;
3. Rigging to be used and the specific sequence of operations;
4. Inspection of all rigging equipment, materials, and tools prior to work;
5. Review of all equipment, including but not limited to, collars, ties, and bolts;
6. Permit validity;
7. Qualifications and training of personnel;
8. Relevant weather warnings;
9. Compliance with the manufacturer's manual; and
10. Softening mechanisms, if using nylon slings.

**3319.8.6 Meeting log.** The general contractor, or his or her designee, and/or the company erecting, jumping, climbing, or dismantling the tower or climber crane shall keep a log on site and available to the department at all times that shall include:

1. The dates and times of all safety coordination meetings and pre-jump safety meetings held;

2. The names, titles, and company affiliations of all those present at the meetings;
3. A summary of what was discussed during each meeting, including specific tasks and the name of the person to whom they were assigned;
4. A list of the decisions made at the meeting; and
5. Certification of worker training pursuant to Section 3319.10.

**3319.8.7 Inspection and certification by the engineer of record.** Prior to jumping or climbing a tower or climber crane, the engineer of record for the crane must provide the department with a certified, signed, and sealed report stating that:

1. He or she (or his or her designee) has inspected the crane installation prior to the pre-jump safety meeting, and providing the date of inspection;
2. He or she has found no hazardous conditions during the crane inspection or any other condition within his or her purview that adversely affects the safety of erection, dismantling, climbing, or jumping operations;
3. The crane is installed according to the plans approved by the department as well as in accordance with the manufacturer's specifications to the extent applicable; and
4. The appropriate technical testing records for the crane, including torque, plumb, and magnetic particle or other appropriate reports comply with safety requirements and with the manufacturer's specifications.

**3319.8.8 Erection, jumping, climbing, and dismantling operations.** The erection, jumping, climbing, and dismantling operations for tower and climber cranes shall be subject to the following requirements:

1. The licensed master, tower or climber crane rigger, the rigger foreman, and the crane safety coordinator or designee, shall be present at the job site during erection, jumping, climbing, and dismantling of the tower or climber crane;
2. Cranes or derricks located either within the lot line or on the street, and used to erect, jump, climb, or dismantle tower or climber cranes, shall be subject to certificate of on-site inspection requirements;
3. A load radius chart approved by department shall be posted in the cabin of the crane;
4. The approved erection, jumping, climbing, or dismantling procedure and sequence, with weights of assemblies and components clearly marked, shall be given by the crane safety coordinator to the licensed operator of the crane or derrick and to the rigger prior to commencement of the work;
5. No tower or climber crane shall be placed, erected or disassembled in any roadway, sidewalk, or street unless a permit is first obtained from the New York City Department of Transportation;



6. All accepted or approved installed safety devices on a crane involved in the erection, jumping, climbing, or dismantling procedure shall have been calibrated within the time period provided by department rules or manufacturer's specifications; and
7. The safety devices of the tower or climber crane shall be inspected by the licensed crane operator as part of the inspection procedure.

**3319.9 Slings.** Slings shall be used in accordance with the following requirements and any rules promulgated by the commissioner.

**3319.9.1 Use of nylon slings in conjunction with climber or tower crane erection, jumping, climbing, and dismantling.** Nylon slings shall only be used in conjunction with climber or tower crane erection, jumping, climbing, and dismantling if the manufacturer's manual specifically states or recommends the use of nylon slings. Nylon slings shall not be used unless softening mechanisms have been applied to all sharp edges.

**3319.9.2 Discarded rope.** Discarded rope shall not be used for slings.

### **3319.10 Worker training.**

**3319.10.1 Training requirements.** All workers engaged in the erection, jumping, climbing, rigging, or dismantling of a climber or tower crane, including the licensed rigger and the rigger foreman, shall have satisfactorily completed a department-approved training course of not less than thirty hours. Such course shall, at a minimum, include instruction on fall protection, crane assembly and disassembly, pre-lift planning, weights and materials, the use of slings, lifting/lowering loads, signaling and other proper means of communication with the crane operator, crane and hoist inspections, rigging requirements, and generally how to avoid accidents with cranes and hoists. The commissioner may by rule identify additional types of cranes for which such training is necessary. Any person who, within the three years prior to the effective date of this section, has successfully completed at least a thirty-hour training course need not take a second thirty-hour course, provided such person can provide to the department a dated certificate as set forth in this section evidencing completion of such a training course. Such person shall, however, take a department-approved eight-hour re-certification course within three years of the initial course and every three years thereafter. Successful completion of the training or re-certification course shall be evidenced by a dated certificate issued by the provider of the training or re-certification course. The certificate shall include such information as specified by the department by rule. The certificate, or a valid wallet card version thereof, shall be readily available to the commissioner upon request.

**3319.10.1.1 Training providers.** Such training or refresher course shall be conducted (i) pursuant to a registered New York state department of labor training program, or (ii) by a provider approved by the department.

**3319.10.2 Certification.** Prior to erecting, jumping, climbing or dismantling the climber or tower crane, or other crane type the commissioner specifies by rule, the master, climber or tower crane rigger shall certify in the meeting log, described in Section 3319.8.6, that the rigger foreman and all other members of the "jumping crew" and back-up personnel have satisfactorily completed all training requirements.

## **SECTION BC 3320 MATERIAL HANDLING EQUIPMENT**

**3320.1 Scope.** Material handling equipment shall meet and be used in accordance with the requirements of this section.

**3320.2 Requirements.** Material handling equipment shall be installed, operated, and maintained to eliminate hazard to the public or to property. It shall be unlawful to operate any such equipment that is not provided with a positive means for preventing the unauthorized operation of such machine. The means whereby such machines may be made inoperative shall be acceptable to the commissioner.

**3320.3 Operation.** Only operators designated by the person causing such machinery to be used shall operate material handling machinery. Operators and signalmen/signalwoman shall be experienced at the operation they perform. The operator shall be responsible for making the machine inoperative before he or she leaves the machine.

**3320.3.1 Loading.** Loading of material handling equipment shall be conducted in accordance with the following requirements:

1. Material handling equipment shall not be loaded in excess of the rated load specified by the manufacturer. When necessary, manufacturer load ratings shall be reduced to take into account effects of wind, ground condition and operating speed.
2. Rated load capacities and required charts shall be conspicuously posted on all material handling equipment or on the job site and shall be available to the commissioner at all times.
3. All loads shall be properly trimmed to prevent the dislodgment of any part during raising, lowering, swinging or transit.
4. Suspended loads shall be securely slung and properly balanced before they are set in motion.

**3320.3.2 Refueling.** Refueling of material handling equipment shall be conducted in accordance with the following requirements:

1. The engine shall be stopped during refueling, except as otherwise provided in rules promulgated by the commissioner.
2. Open lights, flames, or spark-producing devices shall be kept at a safe distance while refueling an internal combustion engine.
3. No person shall smoke or carry lighted smoking material in the immediate vicinity of the refueling area.



4. "No smoking" signs shall be conspicuously posted in all fueling or fuel storage areas.
5. Fuel shall be kept in containers that meet the requirements of the Fire Department.
6. All other requirements of the Fire Department shall be satisfied.

**3320.4 Notification of accidents involving material handling equipment.** The owner or person directly in charge of any material handling equipment shall immediately notify the commissioner following any accident involving material handling equipment. In such a case, no person shall permit either of the following without the permission of the commissioner:

1. Use of such material handling equipment; or
2. Remove of the material handling equipment or any part thereof from the area of the job site.

**3320.5 Conveyors.** Conveyors shall meet the requirements of Sections 3320.5.1 through 3320.5.3.

**3320.5.1 Walkways.** Walkways along belt conveyors or bucket conveyors shall be kept free of materials and, where 5 feet (127 mm) or more above the ground, shall be provided with a standard guardrail and standard toeboard that meets the requirements of Section 3307.8 along the outside of the walkway. The standard guardrail and standard toeboard may be omitted on the side toward the belt if the walkway is located adjacent to the conveyor.

**3320.5.2 Trippers.** Where trippers are used to control discharge, a device for throwing the belt or bucket drive into neutral shall be installed at each end of the runway.

**3320.5.3 Spillage.** Where conveyor belts cross any traveled way, trays shall be installed to catch spillage and overhead protection shall be provided for persons or traffic passing beneath.

**3320.6 Trucks.** Trucks shall meet the requirements of Sections 3320.6.1 and 3320.6.2.

**3320.6.1 Maintenance.** All parts and accessories of trucks shall be kept in repair. Brakes shall be maintained so that the vehicle with full load may be held on any grade that may be encountered on the job. Provision shall be made for the immediate application of wheel blocks to trucks traversing ramps steeper than one in ten.

**3320.6.2 Loading.** Trucks shall not be loaded beyond the manufacturer's rated capacity, nor beyond the legal load limit, where applicable. The loads shall be trimmed before the truck is set in motion to prevent spillage. Loads that project beyond the sides of the truck, or that may be dislodged in transit, shall be removed or securely lashed in place.

**3320.7 Power buggies.** Power buggies shall meet the requirements of Sections 3320.7.1 and 3320.7.2.

**3320.7.1 Responsibilities of employers and workers.** Employers and workers shall have the following responsibilities regarding power buggies:

1. Every person causing a power buggy to be used shall provide trained and competent operators and

shall carry out or enforce all provisions of this section pertaining to the use, operation and maintenance thereof.

2. No person other than the operator assigned by the employer shall operate a power buggy. A power buggy shall be in the charge and custody of the operator assigned, and no other person shall in any way interfere with or handle it, nor shall the operator cause or permit any other person to do so.
3. No power buggy shall be operated unless it is in good operating condition and is so constructed that it is stable under conditions of normal use.

**3320.7.2 Operation and construction.** Power buggies shall be operated and constructed in accordance with the requirements of Sections 3320.7.2.1 through 3320.7.2.4.

**3320.7.2.1 Brakes.** Every power buggy shall be provided with brakes and tire surfaces capable of bringing it to a full stop within 25 feet (635 mm) on a level surface that is similar to the one on which it will be used and at full rated load and maximum design speed. Brakes shall be capable of being fixed in engagement to hold the full load stationary on a 25 percent grade.

**3320.7.2.2 Accidental starting.** All movement controls of every power buggy shall be so arranged or shielded that they cannot be inadvertently engaged or the buggy accidentally set in motion.

**3320.7.2.3 Parking on grades.** No power buggy shall be left unattended on any grade sufficiently steep to cause it to coast if free of engine and brake resistance.

**3320.7.2.4 Use on ramps, runways and platforms.** Power buggies shall not be used on ramps, runways, or platforms that do not meet the requirements of Section 3315

**3320.8 Lift and fork trucks.** Lift and fork trucks shall meet the requirements of Sections 3320.8.1 through 3320.8.4.

**3320.8.1 Load capacity.** A metal plate with readily legible etched or stamped figures giving the capacity rating in pounds shall be attached to every lift or fork truck.

**3320.8.2 Maintenance.** All parts and accessories of lift or fork trucks shall be kept in repair and with brakes adequate to maintain the fully loaded vehicle on any grade that may be encountered on the job.

**3320.8.3 Loading.** No lift or fork truck shall be loaded beyond its capacity rating. No hand-operated pallet truck loaded so that any point on the load is at a greater height than 4 feet 6 inches (114 mm) above the floor shall be moved by pushing unless handled by two persons.

**3320.8.4 Prohibited use.** No lift or fork truck shall be in motion when the loaded forks are elevated higher than necessary to clear obstructions, except as may be required for positioning, picking up, or depositing the load.

**3320.9 Hand propelled vehicles.** Hand propelled vehicles shall be constructed and braked to withstand the loads to be carried and shall be maintained in repair. Vehicles with loose parts shall not be used.

**3320.10 Mixing machines.** Where the public may have access to the working area near charging skips, standard guardrails that meet the requirements of Section 3307.8 shall be erected to enclose the area under the raised skip and the mixing machine. Each time before raising or lowering the charging skip, the operator shall ascertain that no one is in the danger zone.

**3320.11 Jacks.** Jacks shall meet the requirements of Sections 3320.11.1 through 3320.11.5.

**3320.11.1 Marking.** The rated capacity of every jack shall be legibly marked in a prominent location on the jack by casting or stamping. The manufacturer shall designate the intended supporting point of the load and the maximum permissible length of lever and force applied.

**3320.11.2 Overtravel to be limited.** Every jack shall, where practicable, be provided with a positive stop to prevent overtravel; otherwise an indicator to clearly show overtravel shall be provided on the jack.

**3320.11.3 Maintenance.** Lubrication and operation of jacks shall be in accordance with the recommendations of the manufacturer.

**3320.11.4 Foundations.** Jacks shall rest on a firm, level foundation adequate to support the load.

**3320.11.5 Blocking required.** When the object has been lifted to the desired height, blocking or cribbing shall be immediately placed under it if the jack does not have built-in safety devices such as stop-rings, locknuts or place-in cylinder sleeves.

**3320.12 Cableways.** The construction, installation, inspection, maintenance and use of cableways shall be in conformance with rules.



# CHAPTER 34

# RESERVED

NYC







# CHAPTER 35

## REFERENCED STANDARDS

### SECTION BC 3501 GENERAL

**3501.1 General.** This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard.

**3501.2 Subsequent additions, modifications, or deletions.** Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to these standards in accordance with Section 28-103.19 of the *Administrative Code*.

**3501.3 Applicability.** The application of the referenced standards shall be as specified in Section 102.4.

### SECTION BC 3502 STANDARDS

AA		Aluminum Association 1525 Wilson Boulevard, Suite 600 Arlington, VA 22209
Standard reference number	Title	Referenced in code section number
ADM—00	Specifications & Guidelines for Aluminum Structures . . . . .	1704.28.1, 2002.1
ADM 1—05	Aluminum Design Manual: Part 1-A Specification for Aluminum Structures, Allowable Stress Design; and Part 1-B-Aluminum Structures, Load and Resistance Factor Design . . . . .	1604.3.5
ASM 35—00	Aluminum Sheet Metal Work in Building Construction (Fourth Edition) . . . . .	2002.1

AAMA		American Architectural Manufacturers Association 1827 Waldon Office Square, Suite 104 Schaumburg, IL 60173
Standard reference number	Title	Referenced in code section number
1402—86	Standard Specifications for Aluminum Siding, Soffit and Fascia . . . . .	1404.5.1
AAMA/WDMA/CSA 101/1.S.2/A440—08	North American Fenestration Standard/Specifications for Windows, Doors, and Skylights . . . . .	1715.5.1, 2405.5

AASHTO		American Association of State Highway and Transportation Officials 444 N Capitol Street NW, Suite 249 Washington, DC 20001
Standard reference number	Title	Referenced in code section number
T318—07	Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying . . . . .	1905.6.2.1, 1905.6.3.6

## REFERENCED STANDARDS

# ACI

American Concrete Institute  
38800 Country Club Drive  
Farmington Hills, MI 48331

Standard reference number	Title	Referenced in code section number
216.1—07	Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies . . . . .	Table 720.1(2), 721.1
301—05	Specification for Structural Concrete . . . . .	1905.2.4, 1905.6.3.7
306—90	Standard Specification for Cold Weather Concreting—Reapproved 2002 . . . . .	Table 1904.4.2
318—11‡	Building Code Requirements for Structural Concrete . . . . .	406.5.4, 721.2.4.3, 1604.3.2, Table 1613.8, Table 1704.3, 1704.3.1.3, Table 1704.4, 1704.4.1 Table 1704.32, 1805.5.7.2, 1805.9, Table 1808.2.13, 1808.9.2.1, 1808.9.3, 1808.9.3.1, 1809.6.3.2, 1809.6.3.2.2, 1810.1.2.5.1, 1810.1.2.5.2, 1810.7.4.1, 1810.8.3, 1810.8.4, 1901.2, 1901.3, 1901.4, 1902.1, 1903.1, 1903.2, 1903.3, 1903.4, 1903.5, 1903.5.1, 1903.5.2, 1903.6, 1903.7, 1904.1, 1904.2, 1904.3, 1904.4.1, 1904.5, 1905.1.1, 1905.1.4, 1905.3, 1905.4, 1905.5, 1905.6.5.5, 1905.6.6, 1905.8.3, 1905.11.3, 1906.1, 1906.2, 1906.3, 1906.4, 1907.1, 1907.2, 1907.4.1, 1907.6, 1907.7.2, 1907.7.3, 1907.7.4, 1907.7.5, 1907.7.6, 1907.8, 1907.9, 1907.10, 1907.11, 1907.12, 1907.13, 1908, 1908.1, 1908.1.1, 1908.1.2, 1908.1.3, 1908.1.4, 1908.1.5, 1908.1.6, 1908.1.7, 1908.1.8, 1908.1.9, 1908.1.11, 1908.2, 1908.2.1, 1909.1, 1909.3, 1909.4, 1909.5, 1909.6, 1912.1, 1912.1.1, 1915.2, 1915.3, 1915.4, 1915.6, 1916.2, 1916.3.1, 2108.3, 2205.3, 3305.3.2
530—08	Building Code Requirements for Masonry Structures . . . . .	1405.6, 1405.6.2, 1405.10, 1604.3.4, 1704.5.1, Table 1704.5.1, 1704.5.2, Table 1704.5.3, 1704.5.3, 2101.2.2, 2101.2.3, 2101.2.3, 2101.2.4, 2101.2.5, 2101.2.6, 2103.8, 2104.2, 2106.1, 2107.1, 2107.2, 2107.3, 2107.4, 2107.5, 2108.1, 2108.2, 2108.3, 2109.1, 2109.1.1, 2109.2, 2109.2.1, 2110.1
530.1—08	Specifications for Masonry Structures. . . . .	1404.3.1, Table 1704.5.1, Table 1704.5.3, 2103.11, 2103.12, 2103.13, 2104.1, 2104.1.1, 2104.1.2, 2104.1.3, 2104.3, 2104.4, 2104.6, 2105.2.2.1.1, 2105.2.2.1.2, 2105.2.2.1.3, 2105.4

# AF&PA

American Forest & Paper Association  
1111 19th St, NW Suite 800  
Washington, DC 20036

Standard reference number	Title	Referenced in code section number
WCD No. 4—89	Wood Construction Data-Plank and Beam Framing for Residential Buildings . . . . .	2306.1.2
WFCM—01	Wood Frame Construction Manual for One-and Two-family Dwellings. . . . .	1609.1.1, 1609.1.1.1, 2301.2, 2308.1, 2308.2.1
TR7—07	Basic Requirements for Permanent Wood Foundation System, Technical Report No. 7 . . . . .	1807.2
NDS—05	National Design Specification (NDS) for Wood Construction with 2005 Supplement . . . . .	721.1, 721.6.3.2, 1716.1.1, 1716.1.4, 1809.5, 1908.1.9, 2302.1, 2304.12, 2306.1, Table 2306.2.1(1), Table 2306.2.1(2), Table 2306.3, Table 2306.6, 2307.1, 2307.1.1
AF&PA—93	Span Tables for Joists and Rafters . . . . .	2306.1.1, 2308.8, 2308.10.2, 2308.10.3
AF&PA PWF—07	Permanent Wood Foundation Design Specification. . . . .	2304.9.5.2
AF&PA SDPWS—08	Special Design Provisions for Wind and Seismic . . . . .	2302.1, 2305.1, 2306.1, 2306.2.1, 2306.2.2, 2306.2.3, 2306.3, Table 2306.3, 2306.4, 2306.5, 2306.6, 2306.7, 2307.1, 2307.1.1

# AHA

American Hardwood Association  
1210 West N.W. Highway  
Palatine, IL 60067

Standard reference number	Title	Referenced in code section number
A135.4—95	Basic Hardboard . . . . .	1404.3.1
A135.6—98	Hardboard Siding . . . . .	1405.3.2

# AISC

American Institute of Steel Construction  
One East Wacker Drive, Suite 700  
Chicago, IL 60601-18021

Standard reference number	Title	Referenced in code section number
341—05	Seismic Provisions for Structural Steel Buildings, including Supplement No 1. Dated 2005 . . . .	1613.6.1, 2205.2.1, 2205.2.2, 2205.3, 2205.3.1
360—05	Specification for Structural Steel Buildings . . . . .	721.5.2.2.1, 1604.3.3, 1704.3.3, Table 1704.3, 1915.2, 1915.3, 1915.4, 1915.6, 2203.1, 2203.2, 2205.1, 2205.1.1, 2205.3, 2205.6, 2205.6.2, 2205.6.3, 2212.2, 3305.2

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American Institute of Steel Construction  
25 Massachusetts Avenue, NW  
Suite 100  
Washington, DC 20001

Standard reference number	Title	Referenced in code section number
S100—07	North American Specification for the Design of Cold-formed Steel Structural Members . . . . .	1604.3.3, 1908.1.9, 2203.1, 2209.1, 2210.2, 2210.4, 2210.5
S200—07	North American Standard for Cold-formed Steel Framing—General Provisions . . . . .	Table 1704.3.4, 2203.1, 2203.2, 2210.1
S211—07	North American Standard for Cold-formed Steel Framing—Wall Stud Design . . . . .	2210.4
S212—07	North American Standard for Cold-formed Steel Framing—Header Design . . . . .	2210.2
S213—07	North American Standard for Cold-formed Steel Framing—Lateral Design . . . . .	2210.6
S214—07	North American Standard For Cold-formed Steel Framing—Truss Design, with Supplement 2, dated 2008 . . . . .	2210.3.1, 2210.3.2
S230—07	Standard for Cold-formed Steel Framing—Prescriptive Method for One- and Two-family Dwellings, with Supplement 2, dated 2008 . . . . .	1609.1.1, 1609.1.1.1, 2210.7
S110—07	Supplement No. 1, dated 2005 . . . . .	1613.6.1, 2205.2.1, 2205.2.2, 2205.3, 2205.3.1
S210—07	Standard for Seismic Design of Cold-formed Steel Structural Systems—Special Bolted . . . . .	Table 1613.8
	North American Standard for Cold-formed Steel Framing—Floor and Roof System Design . . . . .	2210.5

# 

American Institute of Timber Construction  
Suite 140  
7012 S. Revere Parkway  
Englewood, CO 80112

Standard reference number	Title	Referenced in code section number
AITC Technical Note 7—96	Calculation of Fire Resistance of Glued Laminated Timbers . . . . .	721.6.3.3
AITC 104—03	Typical Construction Details . . . . .	2306.1
AITC 110—01	Standard Appearance Grades for Structural Glued Laminated Timber . . . . .	2306.1
AITC 113—01	Standard for Dimensions of Structural Glued Laminated Timber . . . . .	2306.1
AITC 117—04	Standard Specifications for Structural Glued Laminated Timber of Softwood Species . . . . .	2306.1
AITC 119—96	Standard Specifications for Structural Glued Laminated Timber of Hardwood Species . . . . .	2306.1
AITC 200—04	Structural Glued Laminated Timber . . . . .	2306.1
ANSI/AITC A 190.1—07	Structural Glued Laminated Timber . . . . .	2303.1.3, 2306.1

# 

Automotive Lift Institute  
P.O. Box 85  
Courtland, NY 13045

Standard reference number	Title	Referenced in code section number
ALI ALCTV—2006	Standard for Automobile Lifts—Safety Requirements for Construction, Testing and Validation (ANSI) . . . . .	3001.2

# 

American National Standards Institute  
25 West 43rd Street, Fourth Floor  
New York, NY 10036

Standard reference number	Title	Referenced in code section number
A10.3—06	Safety Requirements for Powder-actuated Fastening Systems . . . . .	3311.3, 3311.4, 3311.4.1, 3311.4.2, 3311.4.3, 3311.4.4, 3311.4.5, 3311.4.6, 3311.4.7, 3311.4.8, 3311.4.9, 3311.4.10, 3311.4.11, 3311.4.12
A10.4—07†	Safety Requirements for Personnel Hoists . . . . .	3010.3
A10.11—10	Safety Requirements for Personnel and Debris Nets . . . . .	3302.1, 3308.6.2, 3308.6.2.3, 3308.6.2.4, 3308.6.2.5, 3308.6.2.6, 3308.6.2.7, 3308.6.2.8, 3308.6.2.9, 3308.6.2.10, 3308.6.2.11, 3308.6.4
A 13.1—96 (Reaffirmed 2002)	Scheme for the Identification of Piping Systems . . . . .	415.8.6.4, 903.6, 905.11
A108.1A—99	Installation of Ceramic Tile in the Wet-set Method, with Portland Cement Mortar . . . . .	2103.10
A108.1B—99	Installation of Ceramic Tile, Quarry Tile on a Cured Portland Cement Mortar Setting Bed with Dry-set or Latex-Portland Mortar . . . . .	2103.10
A108.4—99	Installation of Ceramic Tile with Organic Adhesives or Water-cleanable Tile-setting Epoxy Adhesive . . . . .	2103.10.6
A108.5—99	Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex-portland Cement Mortar . . . . .	2103.10.1, 2103.10.2
A108.6—99	Installation of Ceramic Tile with Chemical-resistant, Water Cleanable Tile-setting-and-grouting Epoxy . . . . .	2103.10.3
A108.8—99	Installation of Ceramic Tile with Chemical-resistant Furan Resin Mortar and Grout . . . . .	2103.10.4
A108.9—99	Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout . . . . .	2103.10.5
A108.10—99	Installation of Grout in Tilework . . . . .	2103.10.7
A118.1—99	American National Standard Specifications for Dry-set Portland Cement Mortar . . . . .	2103.10.1
A118.3—99	American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy and Water Cleanable Tile-setting Epoxy Adhesive . . . . .	2103.10.3



## REFERENCED STANDARDS

### ANSI—continued

A118.4—99	American National Standard Specifications for Latex-Portland Cement Mortar . . . . .	2103.10.2
A118.5—99	American National Standard Specifications for Chemical-resistant Furan Mortar and Grouts for Tile Installation . . . . .	2103.10.4
A118.6—99	American National Standard Specifications for Cement Grouts for Tile Installation . . . . .	2103.10.7
A118.8—99	American National Standard Specifications for Modified Epoxy Emulsion Mortar/Grout . . . . .	2103.10.5
A136.1—99	American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile . . . . .	2103.10.6
A137.1—88	American National Standard Specifications for Ceramic Tile . . . . .	2103.5
A208.1—99	Particleboard . . . . .	2303.1.7, 2303.1.7.1
Z97.1—04	Safety Glazing Materials Used in Buildings—Safety Performance Specifications and Methods of Test . . . . .	2406.1.2, 2406.2, 2406.3.1, Table 2406.2(2), 2407.1.4.1, 2408.1, 2408.2.1, 2408.3, 2409.2, 2409.3.1
Z535.1—06	Safety Colors . . . . .	1024.2.6.2, 1024.3.1, 1024.6.1
Z535.2—07	Environmental and Facility Safety Signs . . . . .	K1-6.1.6.9.2

## APA

APA - Engineered Wood Association  
7011 South 19th Street  
Tacoma, WA 98466-5333

Standard reference number	Title	Referenced in code section number
APA PDS—04	Design and Fabrication of Plywood Curved Panels (revised 1995) . . . . .	2306.1
APA PDS Supplement 1—90	Design and Fabrication of Plywood-lumber beams (revised 1998) . . . . .	2306.1
APA PDS Supplement 2—92	Design and Fabrication of Plywood Stressed-skin Panels (revised 1996) . . . . .	2306.1
APA PDS Supplement 3—90	Design and Fabrication of Plywood Sandwich Panels (revised 1993) . . . . .	2306.1
APA PDS Supplement 4—90	Design and Fabrication of All-plywood Beams (revised 1995) . . . . .	2306.1
APA PDS Supplement 5—95	Builders Tips: Proper Storage and Handling of Glulam Beams . . . . .	2306.1
EWS R540—02	Glued Laminated Beam Design Tables . . . . .	2306.1
EWS S475—01	Field Notching and Drilling of Glued Laminated Timber Beams . . . . .	2306.1
EWS S560—03	Glulam Connection Details . . . . .	2306.1
EWS T300—05	Product Guide-Glulam . . . . .	2306.1
EWS X440—03	Glulam in Residential Construction -Western Edition . . . . .	2306.1
EWS X450—01	Panel Design Specifications . . . . .	2306.1

## APSP

The Association of Pool & Spa Professionals  
2111 Eisenhower Avenue  
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
ANSI/APSP 7—06	Standard for Suction Entrapment Avoidance in Swimming Pools, Wading Pools, Spas, Hot Tubs and Catch Basins. . . . .	3109.3.1.1

## AREMA

American Railway Engineering and Maintenance-of-Way Association  
10003 Derekwood Lane, Suite 210  
Lanham, Maryland 20706

Standard reference number	Title	Referenced in code section number
AREMA—2012	Manual for Railway Engineering . . . . .	1607.8.3

## ASABE

American Society of Agricultural and Biological Engineers  
2950 Niles Road  
St. Joseph, MI 49085

Standard reference number	Title	Referenced in code section number
EP 484.2 (2003)	Diaphragm Design of Metal-clad, Post-frame Rectangular Buildings . . . . .	2306.1
EP 486.1 (2000)	Shallow-post Foundation Design . . . . .	2306.1
EP 559 (1997)	Design Requirements and Bending Properties for Mechanically Laminated Columns . . . . .	2306.1

# ASCE/SEI

American Society of Civil Engineers  
Structural Engineering Institute  
1801 Alexander Bell Drive  
Reston, VA 20191-4400

Standard reference number	Title	Referenced in code section number
3—91	Structural Design of Composite Slabs . . . . .	1604.3.3, 2209.2.1
5—08	Building Code Requirements for Masonry Structures . . . . . 1405.6, 1405.6.2, 1405.10, 1604.3.4, 1704.5.1, Table 1704.5.1, 1704.5.2, 1704.5.3, Table 1704.5.3, 2101.2.2, 2101.2.3, 2101.2.4, 2101.2.5, 2101.2.6, 2104.2, 2106.1, 2107.1, 2107.2, 2107.3, 2107.4, 2107.5, 2108.1, 2108.2, 2108.3, 2109.1, 2109.1.1, 2109.2, 2109.2.1, 2110.1	
6—08	Specifications for Masonry Structures . . . . . 1405.6.1, Table 1704.5.1, Table 1704.5.3, 2103.8, 2103.11, 2103.12, 2103.13, 2104.1, 2104.1.1, 2104.1.2, 2104.1.3, 2104.3, 2104.4, 2104.6, 2105.2.2.1.1, 2105.2.2.1.2, 2105.2.2.1.3, 2105.4	
7—05	Minimum Design Loads for Buildings and Other Structures including Supplements No.1 and 2, excluding Chapter 14 and Appendix 11A . . . . . Table 1504.8, 1602, 1603.1.8, 1604.8.2, 1605.2.2, 1605.3.1.2, Table 1607.1, 1607.11.1, 1608.1, 1608.3, 1608.3.5, 1608.3.6, 1608.4, 1608.5, 1608.6, 1608.7, 1608.8, 1608.9, 1609.1.1, 1609.1.1.2.1, 1609.1.1.2.2, 1609.7.3, 1611.2, 1908.1.1, 1908.1.2, 2205.2.1, 2205.3, 2205.3.1, 2208.1, Table 2308.10.1, 2404.1, 2505.1, 2505.2, G104.5.2, G201.2, G304.2, G402	
7—10	Minimum Design Loads for Buildings and Other Structures . . . . . 909.10.6, 1602, 1604.3, 1604.10, 1605.1, 1613.1, 1613.2, 1613.5.5.1, 1613.5.6, Table 1613.5.6(2), 1613.5.6.1, 1613.5.6.2, 1613.6, 1613.6.1, 1613.7, 1613.8, Table 1613.8, 1801.2.1, 1808.9.2.1, 1808.9.3.2, 1808.9.3.4, 1813.2.1, 1908.1.9	
8—02	Standard Specification for the Design of Cold-formed Stainless Steel Structural Members . . . . .	1604.3.3, 2209.1
19—96	Structural Applications of Steel Cables for Buildings . . . . .	2207.1, 2207.2
24—05*	Flood Resistant Design and Construction . . . . . G103.1, G104.3, G104.5.1, G104.5.2, G105.2, G105.4, G201.2, G301.1, G303.2, G303.3, G303.4, G303.7, G304.1.1, G304.1.2, G304.2, G304.3, G305.1, G307.1, G307.2, G307.3, G308.1, G308.3, G310.3, G402, G501.1	
29—05	Standard Calculation Methods for Structural Fire Protection . . . . .	721.1
32—01	Design and Construction of Frost Protected Shallow Foundations . . . . .	1805.3.1
*As modified in Appendix G		

# ASME

American Society of Mechanical Engineers  
Three Park Avenue  
New York, NY 10016-5990

Standard reference number	Title	Referenced in code section number
A17.1—00* with supplements A17.1a—02 and A17.1b—03	Safety Code for Elevators and Escalators . . . . . 1007.4, 1109.6.1, 1607.8.1, 2409.1, 2409.2, 2409.3, 3001.2, 3001.4, 3001.9, 3002.1.1, 3002.5, 3002.8, 3003.2, 3003.3.1, 3003.3.3, 3009.3, K101.1, K1-6.1.3.5.4, K1-Table N1, K2-6.21.2, K2-6.21.3, K3-1.5, K3-2.6.7, K3-2.6.7, K3-3.8.4.1, K4-1.1	
A17.1—2010*	Safety Code for Elevators and Escalators . . . . . 907.3.3, 911.1.5, K4-2.18.5.1, K4-2.20.3, K4-2.20.4	
A17.1s—2005*	Supplement to Safety Code for Elevators and Escalators . . . . .	3001.2, K4-401.1
A17.2—2002	Safety Code For Existing Elevators And Escalators . . . . .	3001.2, K1-8.10.2.2.2, K1-8.10.4.1.1
A17.3—02	Guide for Inspection of Elevators, Escalators & Moving Walk, Elevator Industry Inspection Handbook . . . . .	3001.2, K1- 2.12.6.2.6, K301.1, K3-2.7.2, K3-3.10.12
A17.5—2004	Elevator and Escalator Electrical Equipment . . . . .	3001.2
A17.6—2010*	Standard for Elevator Suspension, Compensation, and Governor Systems . . . . .	K4-2.18.5.1, K4-2.20.3, K4-2.20.4
A18.1—2005	Safety Standard for Platform Lifts and Stairway Chairlifts . . . . .	1007.5, 1109.7, 3001.2, K1-Table N1
A90.1—03	Safety Standard for Belt Manlifts . . . . .	3001.2, K1-Table N1
B16.18—2001 (Reaffirmed 2005)	Cast Copper Alloy Solder Joint Pressure Fittings . . . . .	909.13.1
B16.22—2001 (Reaffirmed 2005)	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings . . . . .	909.13.1
B20.1—2006*	Safety Standard for Conveyors and Related Equipment . . . . .	3001.2, 3005.3, K1-Table N1, K1-7.4.2, K2-201.1
B 31.3—2004	Process Piping . . . . .	415.8.6.1
*As modified in Appendix K		

# ASTM

ASTM International  
100 Barr Harbor Drive  
West Conshohocken, PA 19428-2959

Standard reference number	Title	Referenced in code section number
A 36—05	Specification for Carbon Structural Steel . . . . .	1809.7.1
A 153—05	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware . . . . .	2304.9.5
A 240—07	Standard Specification for Chromium and Chromium-nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications . . . . .	Table 1507.4.3(1)
A 252—98(2002)	Specification for Welded and Seamless Steel Pipe Piles . . . . .	1809.7.1, 1810.6.1
A 283—03	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates . . . . .	1809.7.1, 1810.6.1
A 307—04e01	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength . . . . .	1911.1
A 416—06	Specification for Steel Strand, Uncoated Seven-wire for Prestressed Concrete . . . . .	1809.6.3.1
A 463 T2 65—05	Standard Specification for Steel Sheet, Aluminum-coated, by the Hot-dip Process . . . . .	Table 1507.4.3(2)
A 572—07	Specification for High-strength Low-alloy Columbium-vanadium Structural Steel . . . . .	1809.7.1

## REFERENCED STANDARDS

### ASTM—continued

A 588—05	Specification for High-strength Low-alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 inches (100 mm) Thick . . . . .	1809.7.1
A 615—04a	Specification for Deformed and Plain Billet-steel Bars for Concrete Reinforcement . . . . .	1810.7.2.1, 1810.8.1
A 653—07	Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-coated Galvannealed by the Hot-dip Process . . . . .	2211.2.2, 2211.2.2.1, 2304.9.5.1
A 653 G-90—07	Specification for Steel Sheet, Zinc-coated Galvanized or Zinc-iron Alloy-coated Galvannealed by the Hot-dip Process . . . . .	Table 1507.4.3(1), Table 1507.4.3(2)
A 690—07	Standard Specification for High-strength Low-alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments . . . . .	1809.7.1
A 706—05a	Specification for Low-alloy Steel Deformed and Plain Bars for Concrete Reinforcement . . . . .	1704.4.1, 1903.5.2, 2107.4, 2108.3
A 722—07	Specification for Uncoated High-strength Steel Bar for Prestressing Concrete . . . . .	1810.7.2.1, 1810.8.1
A 755—03	Specification for Steel Sheet, Metallic-coated by the Hot-dip Process and Prepainted by the Coil-coating Process for Exterior Exposed Building Products . . . . .	Table 1507.4.3(1), Table 1507.4.3(2)
A 792/A 792M—06a	Specification for Steel Sheet, 55% Aluminum-zinc Alloy-coated by the Hot-Dip Process . . . . .	Table 1507.4.3(1), Table 1507.4.3(2)
A 875/A 875M—06	Standard Specification for Steel Sheet Zinc-5 percent, Aluminum Alloy-coated by the Hot Dip Process . . . . .	Table 1507.4.3(2)
A 913—04	Specification for High-strength Low-alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-tempering Process (QST) . . . . .	1809.7.1
A 924—07	Standard Specification for General Requirements for Steel Sheet, Metallic-coated by the Hot-dip Process . . . . .	Table 1507.4.3(1)
A 992/A 992M—06a	Standard Specification for Structural Shapes . . . . .	1809.7.1
B 42—02 (e2001)	Specification for Seamless Copper Pipe, Standard Sizes . . . . .	909.13.1
B 43—98 (2004)	Specification for Seamless Red Brass Pipe, Standard Sizes . . . . .	909.13.1
B 68—02	Specification for Seamless Copper Tube, Bright Annealed (Metric) . . . . .	909.13.1
B 88—03	Specification for Seamless Copper Water Tube . . . . .	909.13.1
B 101—02	Specification for Lead-coated Copper Sheet and Strip for Building Construction . . . . .	1404.5.3, Table 1507.4.3(1), Table 1507.2.9.2
B 209—06	Specification for Aluminum and Aluminum Alloy Steel and Plate . . . . .	Table 1507.4.3(1)
B 251—02(e01)	Specification for General Requirements for Wrought Seamless Copper and Copper-alloy Tube . . . . .	909.13.1
B 280—03	Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service . . . . .	909.13.1
B 370—03	Standard Specification for Copper Sheet and Strip for Building Construction . . . . .	1404.5.2, Table 1507.2.9.2, Table 1507.4.3(1)
B 695—03	Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel . . . . .	2304.9.5.1, 2304.9.5.3
C 5—03	Specification for Quicklime for Structural Purposes . . . . .	Table 2507.2
C 22/C 22M—00 (2005)e01	Specification for Gypsum . . . . .	Table 2506.2
C 27—98 (2002)	Specification for Standard Classification of Fireclay and High-alumina Refractory Brick . . . . .	2111.5, 2111.8
C 28/C 28M—00 (2005)	Standard Specification for Gypsum Plasters . . . . .	Table 2507.2
C 31—06	Practice for Making and Curing Concrete Test Specimens in the Field . . . . .	Table 1704.4, 1905.1.3, 1905.6.3.3, 1905.6.3.3.1, 1905.6.3.8, 1905.6.4.2, 3305.3.5.6
C 33—03	Specification for Concrete Aggregates . . . . .	721.3.1.4, 721.4.1.1.3
C 34—03	Specification for Structural Clay Load-bearing Wall Tile . . . . .	2103.2
C 35—01 (2005)	Specification for Inorganic Aggregates for Use in Gypsum Plaster . . . . .	Table 2507.2
C 36/C 36M—03	Specification for Gypsum Wallboard . . . . .	Figure 721.5.1(2), Figure 721.5.1(3), Table 2506.2, Table 2508.1
C 37/C 37M—01	Specification for Gypsum Lath . . . . .	Table 2507.2
C 39—12a	Test Method for Compressive Strength of Cylindrical Concrete Specimens . . . . .	1905.6.3.3.3, 1913.5.2, 1913.10.3
C 42—13	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete . . . . .	1913.5.1, 1913.10, 1913.10.1
C 55—06e01	Specification for Concrete Brick . . . . .	Table 721.3.2, 2103.1, 2105.2.2.1.2
C 56—05	Specification for Structural Clay Nonload-bearing Tile . . . . .	2103.2
C 59/C 59M—00 (2006)	Specification for Gypsum Casting and Molding Plaster . . . . .	Table 2507.2
C 61/C 61M—00 (2006)	Specification for Gypsum Keene's Cement . . . . .	Table 2507.2
C 62—05	Specification for Building Brick (Solid Masonry Units Made from Clay or Shale) . . . . .	2103.2, 2105.2.2.1.1
C 67—07	Test Methods of Sampling and Testing Brick and Structural Clay Tile . . . . .	721.4.1.1.1, 2104.5, 2105.2.2.1.1
C 73—05	Specification for Calcium Silicate Face Brick (Sand-lime Brick) . . . . .	Table 721.3.2, 2103.1, 2103.2
C 79—04a	Specification for Treated Core and Nontreated Core Gypsum Sheathing Board . . . . .	Table 2506.2
C 90—06b	Specification for Loadbearing Concrete Masonry Units . . . . .	Table 721.3.2, 2103.1, 2105.2.2.1.2
C 91—05	Specification for Masonry Cement . . . . .	Table 2507.2
C 94—07	Specification for Ready-mixed Concrete . . . . .	110.3.1, 1905.1.3, 1905.6.3.8, 1905.8.2
C 126—99 (2005)	Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units . . . . .	2103.2
C 129—11	Standard Specification for Nonloadbearing Concrete Masonry Units . . . . .	2103.1
C138—08	Standard Test Method for Density (Unit Weight) Yield and Air Content (Gravimetric) of Concrete . . . . .	1905.6.3.6
C 140—07	Test Method Sampling and Testing Concrete Masonry Units and Related Units . . . . .	721.3.1.2, 2105.2.2.1.2
C143—12	Standard Test Method for Slump of Hydraulic-cement Concrete . . . . .	1905.6.3.6
C 150—07	Specification for Portland Cement . . . . .	Table 1904.4.2, Table 2507.2
C 172—04	Practice for Sampling Freshly Mixed Concrete . . . . .	Table 1704.4, 1905.6.3.2
C173—12	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method . . . . .	1905.6.3.6
C 199—84 (2005)	Test Method for Pier Test for Refractory Mortars . . . . .	2111.5, 2111.8, 2113.12
C 206—03	Specification for Finishing Hydrated Lime . . . . .	Table 2507.2
C 208—95 (2001)	Specification for Cellulosic Fiber Insulating Board . . . . .	Table 1508.2, 2303.1.5
C 212—00 (2006)	Specification for Structural Clay Facing Tile . . . . .	2103.2
C 216—07	Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale) . . . . .	2103.2, 2105.2.2.1.1, Table 720.1(2)
C 231—10	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method . . . . .	1905.6.3.6
C 260—06	Standard Specification for Air-entraining Admixtures for Concrete . . . . .	1905.3.4
C 270—07	Specification for Mortar for Unit Masonry . . . . .	2103.8, 2108.3
C 315—07	Specification for Clay Flue Liners and Chimney Pots . . . . .	2111.8, 2113.11.1, Table 2113.16(1)
C 317—00 (2010)	Standard Specification for Gypsum Concrete . . . . .	1914.1
C 330—05	Specification for Lightweight Aggregates for Structural Concrete . . . . .	721.1.1.1, 1905.1.4
C 331—05	Specification for Lightweight Aggregates for Concrete Masonry Units . . . . .	721.3.1.4, 721.4.1.1.3
C 406—06e01	Specification for Roofing Slate . . . . .	1507.7.5
C 442/C 442M-04	Specification for Gypsum Backing Board and Coreboard and Gypsum Shaftliner Board . . . . .	2506.2

ASTM—continued

C 472—99 (2004)	Specification for Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete. . . . .	2506.2
C 473—06a	Test Method for Physical Testing of Gypsum Panel Products. . . . .	2506.2
C 474—05	Test Methods for Joint Treatment Materials for Gypsum Board Construction. . . . .	2506.2
C 475/C 475M—02(2007)	Specification for Joint Compound and Joint Tape for Finishing Gypsum Wallboard. . . . .	2506.2
C 476—10	Specification for Grout for Masonry. . . . .	2102
C 494—13	Standard Specification for Chemical Admixtures for Concrete. . . . .	1905.3.4
C 503—05	Specification for Marble Dimension Stone (Exterior). . . . .	2103.4
C 511—09	Standard Specification for Mixing Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes. . . . .	1905.6.3.3.2
C 514—04	Specification for Nails for the Application of Gypsum Board. . . . .	Table 720.1(2), Table 720.1(3), 2506.2
C 516—02	Specifications for Vermiculite Loose Fill Thermal Insulation. . . . .	721.3.1.4, 721.4.1.1.3
C 547—06	Specification for Mineral Fiber Pipe Insulation. . . . .	Table 720.1(2), Table 720.1(3)
C 549—06	Specification for Perlite Loose Fill Insulation. . . . .	721.3.1.4, 721.4.1.1.3
C 552—03	Standard Specification for Cellular Glass Thermal Insulation. . . . .	Table 1508.2
C 557—03e01	Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing. . . . .	2506.2
C 568—03	Specification for Limestone Dimension Stone. . . . .	2103.4
C 578—07	Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation. . . . .	Table 1508.2
C 587—04	Specification for Gypsum Veneer Plaster. . . . .	Table 2507.2
C 588/C 588M—01	Specification for Gypsum Base for Veneer Plasters. . . . .	Table 2507.2
C 595—07	Specification for Blended Hydraulic Cements. . . . .	1904.4.2, Table 2507.2
C 615—03	Specification for Granite Dimension Stone. . . . .	2103.4
C 616—03	Specification for Quartz Dimension Stone. . . . .	2103.4
C 618—99	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete. . . . .	Table 1904.4.2
C 622—03	Specification for Slate Dimension Stone. . . . .	2103.4
C 630/C 630M—03	Specification for Water-resistant Gypsum Backing Board. . . . .	Table 2506.2, 2509.2
C 631—95a (2004)	Specification for Bonding Compounds for Interior Gypsum Plastering. . . . .	Table 2507.2
C 635—00*	Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings. . . . .	808.1.1.1, R101.1, R102.1, R102.2, R102.3, Q102.1
C 636—96*	Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels. . . . .	808.1.1.1, R101.1, R103.1, R103.2, R103.3, R103.4, R103.5, R103.6, R103.7, R103.8, R103.9, R103.10, R103.11, R103.12, R103.13, R103.14
C 645—07	Specification for Nonstructural Steel Framing Members. . . . .	Table 2506.2, Table 2507.2
C 652—05a	Specification for Hollow Brick (Hollow Masonry Units Made from Clay or Shale). . . . .	2103.2, 2105.2.2.1.1
C 685—11	Standard Specification for Concrete Made by Volumetric Batching. . . . .	1905.8.2
C 728—05	Specification for Cellulosic Fiber Insulating Board. . . . .	Table 1508.2
C 744—05	Specification for Prefaced Concrete and Calcium Silicate Masonry Units. . . . .	Table 721.3.2, 2103.1
C 754—04	Specification for Installation of Steel Framing Members to Receive Screw-attached Gypsum Panel Products. . . . .	Table 2508.1, Table 2511.1
C 836—06	Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course. . . . .	1507.15.2
C 840—07	Specification for Application and Finishing of Gypsum Board. . . . .	Table 2508.1, 2509.2
C 841—03	Specification for Installation of Interior Lathing and Furring. . . . .	Table 2508.1, Table 2511.1
C 842—05	Specification for Application of Interior Gypsum Plaster. . . . .	Table 2511.1, 2511.3, 2511.4
C 843—99 (2006)	Specification for Application of Gypsum Veneer Plaster. . . . .	Table 2511.1
C 844—04	Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster. . . . .	Table 2508.1
C 845—96	Specification for Expansive Hydraulic Cement. . . . .	Table 1904.4.2
C 847—06	Specification for Metal Lath. . . . .	Table 2507.2
C 887—05	Specification for Packaged, Dry Combined Materials for Surface Bonding Mortar. . . . .	2103.9
C 897—05	Specification for Aggregate for Job-mixed Portland Cement-based Plasters. . . . .	Table 2507.2
C 920—05	Standard Specification for Elastomeric Joint Sealants. . . . .	Table 2506.2
C 926—98a (2005)	Specification for Application of Portland Cement Based-plaster. . . . .	2510.3, Table 2511.1, 2511.3, 2511.4, 2512.1, 2512.1.2, 2512.2, 2512.6, 2512.8.2, 2512.9, 2513.7
C 931/C 931M—04	Specification for Exterior Gypsum Soffit Board. . . . .	Table 2508.1, Table 2506.2, 2508.2
C 932—06	Specification for Surface-applied Bonding Agents for Exterior Plastering. . . . .	Table 2507.2
C 933—05	Specification for Welded Wire Lath. . . . .	Table 2507.2
C 946—91 (2001)	Specification for Practice for Construction of Dry-stacked, Surface-bonded Walls. . . . .	2103.9, 2109.2.2
C 954—04	Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 inch (0.84 mm) to 0.112 inch (2.84 mm) in Thickness. . . . .	2211.2.2.3, Table 2506.2, Table 2507.2
C 955—06	Standard Specification for Load-bearing Transverse and Axial Steel Studs, Runners, Tracks, and Bracing or Bridging, for Screw Application of Gypsum Panel Products and Metal Plaster Base. . . . .	Table 2506.2, Table 2507.2
C 956—97	Specification for Installation of Cast-in-place Reinforced Gypsum Concrete. . . . .	1914.1
C 957—06	Specification for High-solids Content, Cold Liquid-applied Elastomeric Waterproofing Membrane with Integral Wearing Surface. . . . .	1507.15.2
C 960—04	Specification for Predecorated Gypsum Board. . . . .	Table 2506.2
C 989—99	Specification for Ground Granulated Blast-furnace Slag for Use in Concrete and Mortars. . . . .	Table 1904.4.2
C 1002—04	Specification for Steel Self-piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs. . . . .	Table 2506.2, Table 2507.2
C 1007—04	Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories. . . . .	Table 2508.1, Table 2511.1
C 1019—05	Test Method of Sampling and Testing Grout. . . . .	2105.2.2.1.1, 2105.2.2.1.2, 2105.2.2.1.3
C 1029—05a	Specification for Spray-applied Rigid Cellular Polyurethane Thermal Insulation. . . . .	1507.14.2
C 1032—96	Specification for Woven Wire Plaster Base. . . . .	Table 2507.2
C 1047—05	Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base. . . . .	Table 2506.2, Table 2507.2
C 1063—06	Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-based Plaster. . . . .	2510.3, Table 2511.1, 2512.1.1
C 1064—12	Standard Test Method for Temperature of Freshly Mixed Hydraulic-cement Concrete. . . . .	1905.6.3.6
C 1088—07a	Specification for Thin Veneer Brick Units Made from Clay or Shale. . . . .	Table 720.1(2), 2103.2



## REFERENCED STANDARDS

### ASTM—continued

C 1157—00	Performance Specification for Hydraulic Cement . . . . .	Table 1904.4.2
C 1167—03	Specification for Clay Roof Tiles . . . . .	1507.3.4
C 1177/C 1177M—06	Specification for Glass Mat Gypsum Substrate for Use as Sheathing . . . . .	Table 2506.2
C 1178/C 1178M—06	Specification for Coated Mat Water-resistant Gypsum Backing Panel . . . . .	Table 2506.2, 2509.2
C 1186—07	Specification for Flat Nonasbestos Fiber Cement Sheets . . . . .	1401.10, 1405.16.1, 1405.16.2
C 1492—03	Standard Specification for Concrete Roof Tile . . . . .	1507.3.5
C 1240—00E1	Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic-cement Concrete, Mortar and Grout . . . . .	Table 1904.4.2
C 1261—07	Specification for Firebox Brick for Residential Fireplaces . . . . .	2111.5, 2111.8
C 1278/C 1278M—06	Specification for Fiber-reinforced Gypsum Panels . . . . .	Table 2506.2
C 1280—04	Specification for Application of Gypsum Sheathing . . . . .	Table 2508.1, 2508.2
C 1283—07	Practice for Installing Clay Flue Lining . . . . .	2113.12
C 1288—99 (2004)	Standard Specification for Discrete Nonasbestos Fiber-cement Substrate Sheets . . . . .	2509.2
C 1289—07	Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board . . . . .	Table 1508.2
C 1314—07	Test Method for Compressive Strength of Masonry Prisms . . . . .	2105.2.2.2.2, 2105.3.1, 2105.3.2
C 1325—04	Standard Specification for Nonasbestos Fiber-mat Reinforced Cement Substrate Sheets . . . . .	2509.2
C 1328—05	Specification for Plastic (Stucco Cement) . . . . .	Table 2507.2
C 1371—04a (2010)e1	Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers . . . . .	1504.9
C 1386—07	Specification for Precast Autoclaved Aerated Concrete (AAC) Wall Construction Units . . . . .	2102.1, 2103.3, 2105.2.2.1.3
C 1395/1395M—04	Specification for Gypsum Ceiling Board . . . . .	Table 2506.2
C 1396/C 1396M—06a	Specification for Gypsum Board . . . . .	Table 2506.2, Table 2508.1
C 1405—07	Standard Specification for Glazed Brick (Single-fired, Solid Brick Units) . . . . .	2103.2
C 1492—03	Standard Specification for Concrete Roof Tile . . . . .	1507.3.5
C 1549—09	Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer . . . . .	1504.9
C 1629/C 1629M—06	Standard Classification for Abuse-resistant Nondecorated Interior Gypsum Panel Products and Fiber-reinforced Cement Panels . . . . .	403.2.3.1, 403.2.3.2, 403.2.3.4
C 1658/C 1658M—06	Standard Specification for Glass Mat Gypsum Panels . . . . .	Table 2506.2
D 25—99 (2005)	Specification for Round Timber Piles . . . . .	1809.5.1, 1809.5.4, 2303.1.11
D 41—05	Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing . . . . .	Table 1507.10.2
D 43—00	Coal Tar Primer Used in Roofing, Dampproofing and Waterproofing . . . . .	Table 1507.10.2
D 56—05	Test Method for Flash Point by Tag Closed Tester . . . . .	307.2
D 86—07a	Test Method for Distillation of Petroleum Products at Atmospheric Pressure . . . . .	307.2
D 93—07	Test Method for Flash Point By Pensky-Martens Closed Cup Tester . . . . .	307.2
D 225—04	Specification for Asphalt Shingles (Organic Felt) Surfaced with Mineral Granules . . . . .	1507.2.5
D 226—06	Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing . . . . .	1404.2, 1507.2.3, 1507.3.3, 1507.5.3, 1507.6.3, 1507.7.3, Table 1507.8, 1507.8.3, 1507.9.3, 1507.9.5, Table 1507.10.2
D 227—03	Specification for Coal-tar-saturated Organic Felt Used in Roofing and Waterproofing . . . . .	Table 1507.10.2
D 312—00 (2006)	Specification for Asphalt Used in Roofing . . . . .	Table 1507.10.2
D 448—03a	Standard Classification for Sizes of Aggregate for Road and Bridge Construction . . . . .	1507.12.3, 1507.13.3
D 450—07	Specification for Coal-tar Pitch Used in Roofing, Dampproofing and Waterproofing . . . . .	Table 1507.10.2
D 635—06	Test Method for Rate of Burning and/or Extent and Time of Burning of Self-supporting Plastics in a Horizontal Position . . . . .	2606.4, H107.1.1, H117.4
D 692—09	Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures . . . . .	1917.2
D 1073—11	Standard Specification for Fine Aggregate for Bituminous Paving . . . . .	1917.2
D 1143—07	Test Method for Piles Under Static Axial Compressive Load . . . . .	1804.4.1.3, 1812.4.1
D 1227—95 (2007)	Specification for Emulsified Asphalt Used as a Protective Coating for Roofing . . . . .	Table 1507.10.2, 1507.15.2
D 1557—02e01	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/ft <sup>3</sup> (2,700 kN m/m <sup>3</sup> )) . . . . .	1804.2.2
D 1586—99	Specification for Penetration Test and Split-barrel Sampling of Soils . . . . .	1613.5.5, 1802.5
D 1587—00	Standard Practice for Thin-walled Tube Sampling of Soils for Geotechnical Purposes . . . . .	1802.5
D 1761—06	Test Method for Mechanical Fasteners in Wood . . . . .	1716.1.1, 1716.1.2, 1716.1.3
D 1863—05	Specification for Mineral Aggregate Used on Built-up Roofs . . . . .	Table 1507.10.2
D 1929—96 (2001)e01	Test Method for Determining Ignition Properties of Plastics . . . . .	402.16.4, 1407.11.2.1, 2606.4
D 1970—01	Specification for Self-adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roof Underlayment for Ice Dam Protection . . . . .	1507.2.3, 1507.2.4, 1507.2.9.2, 1507.3.9, 1507.5.7, 1507.8.8, 1507.9.9
D 2113—08	Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation . . . . .	1802.5
D 2178—04	Specification for Asphalt Glass Felt Used in Roofing and Waterproofing . . . . .	Table 1507.10.2
D 2216—05	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass . . . . .	1613.5.5
D 2487—06	Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) . . . . .	Table 1610.1, 1802.3
D 2626—04	Specification for Asphalt Saturated and Coated Organic Felt Base Sheet Used in Roofing . . . . .	1507.3.3, Table 1507.10.2
D 2822—05	Specification for Asphalt Roof Cement . . . . .	Table 1507.10.2
D 2823—05	Specification for Asphalt Roof Coatings . . . . .	Table 1507.10.2
D 2843—99 (2004)e01	Test for Density of Smoke from the Burning or Decomposition of Plastics . . . . .	2606.4
D 2898—04	Test Methods for Accelerated Weathering of Fire-retardant-treated Wood for Fire Testing . . . . .	1505.1, 2303.2.4, 2303.2.6
D 3019—94 (2007)	Specification for Lap Cement Used with Asphalt Roll Roofing, Nonfibered, Asbestos Fibered, and Nonasbestos Fibered . . . . .	Table 1507.10.2
D 3161—06	Test Method for a Wind Resistance of Asphalt Shingles (Fan Induced Method) . . . . .	1507.2.7, 1507.2.7.1, Table 1507.2.7.1(2)
D 3200—74 (2005)	Standard Specification and Test Method for Establishing Recommended Design Stresses for Round Timber Construction Poles . . . . .	2303.1.11
D 3201—07	Test Method for Hygroscopic Properties of Fire-retardant-treated Wood and Wood-based Products . . . . .	2303.2.7
D 3273—12	Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber . . . . .	2506.3†
D 3278—04e01	Test Methods for Flash Point of Liquids by Small Scale Closed-cup Apparatus . . . . .	307.2
D 3462—04	Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules . . . . .	1507.2.5
D 3468—99 (2006)e01	Specification for Liquid-applied Neoprene and Chlorosulfonated Polyethylene Used in Roofing and Waterproofing . . . . .	1507.15.2
D 3679—06a	Specification for Rigid Poly (Vinyl Chloride (PVC) Siding) . . . . .	1404.9, 1405.14
D 3689—90 (1995)	Method for Testing Individual Piles Under Static Axial Tensile Load . . . . .	1808.4.2.1, 1812.4.2

ASTM—continued

D 3737—07	Practice for Establishing Allowable Properties for Structural Glued Laminated Timber (Glulam) . . . . .	2303.1.3
D 3746—02	Test Method for Impact Resistance of Bituminous Roofing Systems . . . . .	1504.7
D 3747—79 (2007)	Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation . . . . .	Table 1507.10.2
D 3909—97b (2004)e01	Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules . . . . .	1507.2.9.2, 1507.6.5, Table 1507.10.2
D 3957—06	Standard Practices for Establishing Stress Grades for Structural Members Used in Log Buildings . . . . .	2303.1.10
D 3966—07	Standard Test Methods for Deep Foundations Under Lateral Loads . . . . .	1808.4.3, 1808.4.3.3
D 4022—07	Specification for Coal Tar Roof Cement, Asbestos Containing . . . . .	Table 1507.10.2
D 4272—03	Test Method for Total Energy Impact of Plastic Films by Dart Drop . . . . .	1504.7
D 4434—06	Specification for Poly (Vinyl Chloride) Sheet Roofing . . . . .	1507.13.2
D 4479—07	Specification for Asphalt Roof Coatings - Asbestos-free . . . . .	Table 1507.10.2
D 4586—00	Specification for Asphalt Roof Cement, Asbestos-free . . . . .	Table 1507.10.2
D 4601—04	Specification for Asphalt-coated Glass Fiber Base Sheet Used in Roofing . . . . .	Table 1507.10.2
D 4637—04	Specification for EPDM Sheet Used in Single-ply Roof Membrane . . . . .	1507.12.2
D 4869—05e01	Specification for Asphalt-saturated (Organic Felt) Underlayment Used in Steep Slope Roofing . . . . .	1507.2.3, 1507.5.3, 1507.6.3, 1507.7.3, 1507.8.3, 1507.9.3
D 4897—01	Specification for Asphalt-coated Glass Fiber Venting Base Sheet Used in Roofing . . . . .	Table 1507.10.2
D 4990—97a (2005)e01	Specification for Coal Tar Glass Felt Used in Roofing and Waterproofing . . . . .	Table 1507.10.2
D 4945—00	Test Method for High-strain Dynamic Testing of Piles . . . . .	1808.4.1.4
D 5019—07	Specification for Reinforced Nonvulcanized Polymeric Sheet Used in Roofing Membrane . . . . .	1507.12.2
D 5034—09	Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test) . . . . .	3308.6.3
D 5035—11	Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method) . . . . .	3308.6.3
D 5055—05	Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists . . . . .	2303.1.2
D 5096—02-11	Standard Test Method for Determining the Performance of a Cup Anemometer or Propeller Anemometer . . . . .	3314.4.4.6
D 5456—05a	Specification for Evaluation of Structural Composite Lumber Products . . . . .	2303.1.9
D 5516—03	Test Method of Evaluating the Flexural Properties of Fire-retardant-treated Softwood Plywood Exposed to the Elevated Temperatures . . . . .	2303.2.5.1
D 5643—06	Specification for Coal Tar Roof Cement, Asbestos-free . . . . .	Table 1507.10.2
D 5664—02	Test Methods for Evaluating the Effects of Fire-retardant Treatment and Elevated Temperatures on Strength Properties of Fire-retardant-treated Lumber . . . . .	2303.2.5.2
D 5665—99a (2006)	Specification for Thermoplastic Fabrics Used in Cold-applied Roofing and Waterproofing . . . . .	Table 1507.10.2
D 5726—98 (2005)	Specification for Thermoplastic Fabrics Used in Hot-applied Roofing and Waterproofing . . . . .	Table 1507.10.2
D 6066—11	Standard Practice for Determining the Normalized Penetration Resistance of Sands for Evaluation of Liquefaction Potential . . . . .	1813.2
D 6083—05e01	Specification for Liquid Applied Acrylic Coating Used in Roofing . . . . .	Table 1507.10.2, 1507.15.2
D 6162—00A	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements . . . . .	1507.11.2
D 6163—00 E01	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements . . . . .	1507.11.2
D 6164—05	Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Metal Materials Using Polyester Reinforcements . . . . .	1507.11.2
D 6222—02e01	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements . . . . .	1507.11.2
D 6223—02	Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements . . . . .	1507.11.2
D 6298—05	Specification for Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface . . . . .	1507.11.2
D 6305—02e01	Practice for Calculating Bending Strength Design Adjustment Factors for Fire-retardant-treated Plywood Roof Sheathing . . . . .	2303.2.5.1
D 6380—03	Standard Specification for Asphalt Roll Roofing (Organic Felt) . . . . .	1507.2.9.2, 1507.3.3, 1507.6.5
D 6509—00	Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements . . . . .	1507.11.2
D 6694—07	Standard Specification for Liquid Applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing Systems . . . . .	1507.15.2
D 6754—02	Standard Specification for Ketone Ethylene Ester Based Sheet Roofing . . . . .	1507.13.2
D 6757—07	Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-slope Roofing . . . . .	1507.2.3
D 6841—03	Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-retardant-treated Lumber . . . . .	2303.2.5.2
D 6878—06a	Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing . . . . .	1507.13.2
D 6947—07	Standard Specification for Liquid-applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing System . . . . .	1507.15.2
D 7158—07	Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method) . . . . .	1507.2.7.1, Table 1507.2.7.1(1)
E 84—07	Test Methods for Surface Burning Characteristics of Building Materials . . . . .	402.16.4, 402.11, 703.4.2, 719.1, 719.1.1, 719.1.2, 719.4, 802.1, 803.1.1, 803.1.2, 803.1.4, 803.1.4.1, 806.5, 1407.9, 1407.10.1, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2604.2.4, 2606.4, 2613.3, K1-2.14.2.1.1, K1-2.15.8, K4-2.14.2.1
E 90—04	Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements . . . . .	1207.2, 1207.2.1
E 96—00	Test Method for Water Vapor Transmission of Materials . . . . .	202
E 108—07a	Test Methods for Fire Tests of Roof Coverings . . . . .	1505.1, 2603.6, 2610.2, 2610.3
E 119—07	Test Methods for Fire Tests of Building Construction and Materials . . . . .	703.2, 703.2.1, 703.2.3, 703.3, 703.5, 704.12, 705.7, 705.8.5, 707.6; 712.3.2, 713.3.1, 713.4.1.1, 714.1, 714.4, 715.2, 715.4.5, 716.5.2, 716.5.3, 716.6.1, 716.6.2.1, Table 720.1(1), 1407.10.2, 2103.2, 2603.4, 2603.5.1
E 136—04	Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C . . . . .	703.4.1, 719.1.1
E 330—02	Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference . . . . .	1715.5.2
E 331—01	Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference . . . . .	1403.2
E 336—05	Standard Test Method for Measurement of Airborne Sound Insulation in Buildings . . . . .	1207.2
E 408—13	Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-meter Techniques . . . . .	1504.9

## REFERENCED STANDARDS

### ASTM—continued

E 492—04	Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-ceiling Assemblies Using the Tapping Machine	1207.3
E 605—93 (2006)	Test Method for Thickness and Density of Sprayed Fire-resistive Material (SFRM) Applied to Structural Members	1704.11.4.1, 1704.11.4.2, 1704.11.4.3, 1704.11.5
E 648—06a	Standard Test Method for Critical Radiant Flux of Floor-covering Systems Using a Radiant Heat Energy Source	804.2, 804.3
E 681—04	Test Methods for Concentration Limits of Flammability of Chemical Vapors and Gases	307.2
E 736—00 (2006)	Test Method for Cohesion/Adhesion of Sprayed Fire-resistive Materials Applied to Structural Members	704.13.3.2, 1704.11.6
E 814—06	Test Method of Fire Tests of Through-penetration Firestops	702.1, 713.3.1.2, 713.3.2, 713.4.1.1.2
E 970—00	Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source	719.3.1
E 1007—97	Test Method for Field Measurement of Tapping Machine Impact Sound Transmission through Floor-ceiling Assemblies and Associated Support Structures	1207.3
E 1300—04e01	Practice for Determining Load Resistance of Glass in Buildings	2401.1, 2402.2, 2404.3, 2404.3.3, 2404.3.4, 2404.3.5
E 1354—04a	Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter	402.12.1
E 1592—01	Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference	1504.3.2
E 1602—03	Guide for Construction of Solid Fuel-burning Masonry Heaters	2112.2
E 1918—06	Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-sloped Surfaces in the Field	1504.9
E 1966—01	Test Method for Fire-resistant Joint Systems	702.1, 714.3
E 1980—11	Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-sloped Opaque Surfaces	1504.9
E 2072—10	Standard Specification for Photoluminescent (Phosphorescent) Safety Markings	1024.4
E 2174—09	Standard Practice for Onsite Inspection of Installed Fire Stops	1704.2.7.1
E 2273—07	Standard Practice for Specimen Preparation and Mounting of Site-fabricated Stretch Systems to Access Surface Burning Characteristics	1408.4.1
E 2307—04e01	Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-scale, Multistory Test Apparatus	714.4
E 2393—10a	Standard Practice for On-site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers	1704.27.2
E 2404—07a	Standard Practice for Specimen Preparation and Mounting of Textile, Paper or Vinyl Wall or Ceiling Coverings to Assess Surface Burning Characteristics	803.1
E 2568—07	Standard Specification for PB Exterior Insulation and Finish Systems	1408.2
E 2570—07	Standard Test Methods for Evaluating Water-resistive Barrier (WRB) Coatings Used Under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage	1408.4.1.1, 1704.13.2
E 2573—07	Standard Practice for Specimen Preparation and Mounting of Site-fabricated Stretch to Assess Surface Burning Characteristics	803.1
E 2634—08	Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems	1903.9
E 2751—12	Standard Practice for Design and Performance of Supported Laminated Glass Walkways	2405.1.1
F 547—01	Terminology of Nails for Use with Wood and Wood-based Materials	Table 2506.2
F 1346—91 (2003)	Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs	3109.3.2.1, 3109.4, 3109.5.1.8, 3109.6
F 1667—05	Specification for Driven Fasteners: Nails, Spikes, and Staples	Table 720.1(2), Table 720.1(3), 1507.2.6, 2303.6, Table 2506.2
F 2090—01a (2007)	Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms	1405.13.2
F 2200—05	Standard Specification for Automated Vehicular Gate Construction	3110.3
F 2208—08	Standard Safety Specification for Residential Pool Alarms	3109.3.2.1
G 152—06	Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials	1504.6
G 154—05	Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials	1504.6
G 155—05a	Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials	1504.6

\* As modified in Appendix R, where applicable pursuant to Section 808.1.1.1

# AWPA

American Wood Protection Association  
P.O. Box 361784  
Birmingham, AL 35236-1784

Standard reference number	Title	Referenced in code section number
C1—03	All Timber Products-Preservative Treatment by Pressure Processes	1505.6
C3—03	Piles-Preservative Treatment by Pressure Processes	1809.5.2
C24—03	Sawn Timber Piles Used to Support Residential and Commercial Building	1809.5.2
M4—06	Standard for the Care of Preservative-treated Wood Products	1809.5.2, 2303.1.8
U1—07	USE CATEGORY SYSTEM: User Specification for Treated Wood Except Section 6, Commodity Specification H	Table 1507.9.6, 2303.1.8, 2304.11.2, 2304.11.4, 2304.11.6, 2304.11.7

# AWS

American Welding Society  
550 N.W. LeJeune Road  
Miami, FL 33126

Standard reference number	Title	Referenced in code section number
D1.1—04	Structural Welding Code—Steel . . . . .	1704.3.1.1, Table 1704.3, K1-8.8.1
D1.2—03	Structural Welding Code—Aluminum. . . . .	1704.28.1, 2003.2.2
D1.3—98	Structural Welding Codes—Sheet Steel. . . . .	1704.3.1.2, Table 1704.3, Table 1704.3.4
D1.4—98	Structural Welding Code—Reinforcing Steel . . . . .	1704.3.1.3, Table 1704.3, Table 1704.4, 1903.5.2, 2107.4

# AWWA

American Water Works Association  
6666 West Quincy Avenue  
Denver, CO 80235

Standard reference number	Title	Referenced in code section number
C 104—95	American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water . . . . .	Q105.1

# AWCI

Association of the Wall and Ceiling Industry  
513 West Broad Street, Suite 210  
Falls Church, VA 22046

Standard reference number	Title	Referenced in code section number
12-B—98	Technical Manual 12-B Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-resistive Materials; an Annotated Guide, First Edition . . . . .	1704.12

# BHMA

Builders Hardware Manufacturers' Association  
355 Lexington Avenue, 17th Floor  
New York, NY 10017-6603

Standard reference number	Title	Referenced in code section number
A 156.10—06	Power Operated Pedestrian Doors . . . . .	1008.1.4.2
A 156.19—02	Standard for Power Assist and Low Energy Operated Doors . . . . .	1008.1.4.2

# CAN/ULC

Standards Council of Canada  
270 Albert Street, Suite 200  
Ottawa, Ontario, Canada K1P 6N7

Standard reference number	Title	Referenced in code section number
S102.2—1988	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies with 2000 Revisions . . . . .	719.4
S635—00	Standard for Lining Systems for Existing Masonry or Factory-built Chimneys and Vents. . . . .	2113.11.1.2, 2113.19

# CGSB

Canadian General Standards Board  
Place du Portage 111, 6B1  
11 Laurier Street  
Gatineau, Quebec, Canada K1A 1G6

Standard reference number	Title	Referenced in code section number
37-GP—52M (1984)	Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric . . . . .	1504.7, 1507.12.2
37-GP—56M (1980)	Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing—with December Revisions . . . . .	1507.11.2
37.54—95	Polyvinyl Chloride Roofing and Waterproofing Membrane . . . . .	1507.13.2



## REFERENCED STANDARDS

### CPA

Composite Panel Association  
19465 Deerfield Avenue, Suite 306  
Leesburg, VA 20176

Standard reference number	Title	Referenced in code section number
ANSI A135.4—2004	Basic Hardboard . . . . .	2303.1.6
ANSI A135.5—2004	Prefinished Hardboard Paneling . . . . .	2303.1.6, 2304.6.2
ANSI A135.6—1998	Hardboard Siding . . . . .	2303.1.6

### CPSC

Consumer Product Safety Commission  
4330 East West Highway  
Bethesda, MD 20814-4408

Standard reference number	Title	Referenced in code section number
16 CFR Part 1201(1977)	Safety Standard for Architectural Glazing Material . . . . .	2406.2, Table 2406.2(1), 2406.3.1, 2407.1, 2407.1.4.1, 2408.2.1, 2408.3, 2409.1, 2409.2, 2409.3.1
16 CFR Part 1209 (1979)	Interim Safety Standard for Cellulose Insulation . . . . .	719.6
16 CFR Part 1404 (1979)	Cellulose Insulation . . . . .	719.6
16 CFR Part 1500.44 (2001)	Method for Determining Extremely Flammable and Flammable Solids . . . . .	307.2
16 CFR Part 1630 (2000)	Standard for the Surface Flammability of Carpets and Rugs . . . . .	804.4.1

### CSA

Canadian Standards Association  
5060 Spectrum Way  
Mississauga, Ontario, Canada L4W 5N6

Standard reference number	Title	Referenced in code section number
101/I.S.2/A440—08	Standard/Specification for Windows, Doors and Skylights . . . . .	1715.5.1, 2405.5

### DASMA

Door and Access Systems Manufacturers Association International  
1300 Summer Avenue  
Cleveland, OH 44115-2851

Standard reference number	Title	Referenced in code section number
ANSI/DASMA 107—1997 (R2004) 108—05	Room Test Standard for Garage Doors Using Foam Plastic Insulation . . . . . Standard Method for Testing Sectional Garage Doors and Rolling Doors: Determination of Structural Performance Under Uniform Static Air Pressure . . . . .	2603.4.1.9 1715.5.2

### DOC

U.S. Department of Commerce  
National Institute of Standards and Technology  
1401 Constitution Avenue NW  
Washington, DC 20230

Standard reference number	Title	Referenced in code section number
PS-1—07	Structural Plywood . . . . .	2211.2.2.2, 2303.1.4, 2304.6.2, Table 2304.7(4), Table 2304.7(5), Table 2306.2.1(1), Table 2306.2.1(2)
PS-2—04	Performance Standard for Wood-based Structural-use Panels . . . . .	2211.2.2.2, Table 2304.7(5), Table 2306.2.1(1), 2303.1.4, 2304.6.2
PS 20—05	American Softwood Lumber Standard . . . . .	1809.5.1, 2302.1, 2303.1.1

### DOJ

U.S. Department of Justice  
950 Pennsylvania Avenue, NW  
Civil Rights Division, Disability Rights Section-NYA  
Washington, DC 20530

Standard reference number	Title	Referenced in code section number
36 CFR Part 1192	American with Disabilities Act (ADA) Accessibility Guidelines for Transportation Vehicles (ADAAG) Department of Justice, 1991 . . . . .	E109.2.4, E112.4

# DOL

U.S. Department of Labor  
c/o Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
9 CFR Part 1910.1000 (1974)	Air Contaminants . . . . .	902.1

# DOTn

U.S. Department of Transportation  
c/o Superintendent of Documents  
1200 New Jersey Avenue, SE  
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
49 CFR Parts 100-185 (2005)	Hazardous Materials Regulations . . . . .	307.2
49 CFR Parts 173 (1999)	Specification of Transportation of Explosive and Other Dangerous Articles, UN 0335, UN 0336 Shipping Containers . . . . .	307.2
49 CFR Parts 173.137(2005)	Shippers-General Requirements for Shipments and Packaging—Class 8—Assignment of Packing Group . . . . .	307.2

# EN

European Committee for Standardization (EN)  
Central Secretariat  
Rue de Stassart 36  
B-10 50 Brussels

Standard reference number	Title	Referenced in code section number
1081—98	Resilient Floor Coverings-Determination of the Electrical Resistance . . . . .	406.5.2

# FEMA

Federal Emergency Management Agency  
Federal Center Plaza  
500 C Street S.W.  
Washington, DC 20472

Standard reference number	Title	Referenced in code section number
FIS 360497	Federal Emergency Management Agency Flood Insurance Study report . . . . .	G102.2, G402
FIRMs 360497	Federal Emergency Management Agency Flood Insurance Rate Map . . . . .	G102.2, G102.3, G102.3.1, G102.3.2, G103.3, G104.8, G201.2, G402
FORM 086-0-34—12	Floodproofing Certificate; Federal Emergency Management Agency . . . . .	G105.3, G402
FORM 086-0-33—12	Elevation Certificate; Federal Emergency Management Agency . . . . .	G105.3, G402

# FM

Factory Mutual  
Standards Laboratories Department  
1301 Atwood Avenue, P.O. Box 7500  
Johnson, RI 02919

Standard reference number	Title	Referenced in code section number
4450 (1989)	Approval Standard for Class 1 Insulated Steel Deck Roofs—with Supplements thru 7/92 . . . . .	1508.1, 2603.3, 2603.4.1.5
4470 (1992)	Approval Standard for Class 1 Roof Covers . . . . .	1504.7
4474 (2004)	Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures . . . . .	1504.3.1
4880 (2005)	American National Standard for Evaluating Insulated Wall or Wall and Roof/ Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, Interior and Exterior Finish Systems . . . . .	2603.4, 2603.9
DS 1-35 (2011)	Factory Mutual Data Sheet—Green Roof Systems . . . . .	1507.16.1

# GA

Gypsum Association  
810 First Street N.E. #510  
Washington, DC 20002-4268

Standard reference number	Title	Referenced in code section number
GA 216—07	Application and Finishing of Gypsum Panel Products . . . . .	Table 2508.1, 2509.2
GA 600—06	Fire-resistance Design Manual, 18th Edition . . . . .	Table 720.1(1), Table 720.1(2), Table 720.1(3)

## REFERENCED STANDARDS

### HPVA

Hardwood Plywood Veneer Association  
1825 Michael Faraday Drive  
Reston, VA 20190-5350

Standard reference number	Title	Referenced in code section number
HP-1—2004	Standard for Hardwood and Decorative Plywood . . . . .	2303.3, 2304.6.2

### HUD

U.S. Department of Housing and Urban Development  
451 7th Street, SW  
Washington, DC 20410

Standard reference number	Title	Referenced in code section number
HUD 24 CFR Part 3280 (1994)	Manufactured Home Construction and Safety Standards. . . . .	G201.2, G402

### ICC

International Code Council  
500 New Jersey Ave. NW, 6th Floor  
Washington, DC 20001

Standard reference number	Title	Referenced in code section number
ICC/ANSI A117.1—09	Accessible and Usable Buildings and Facilities . . . . .	406.2.2, 907.2.11.4, 1007.6.5, 1007.9, 1010.1, 1010.6.5, 1010.9, 1011.3, 1022.8.3, 1101.2, 1102.1, 1103.2.3.1, 1104.4, 1105.1.5, 1105.1.6.1, 1106.1, 1106.2.7, 1106.5, 1106.6, 1106.7, 1107.2, 1107.2.1, 1107.2.2, 1107.2.3, 1107.2.3.1, 1107.2.3.2, 1107.2.3.3, 1107.2.3.4, 1107.2.3.5, 1107.2.4, 1107.2.5, 1107.2.6, 1107.2.8, 1107.3.1, 1107.4, 1107.6.1.3, 1108.2.2, 1108.2.3, 1108.2.5, 1108.2.7, 1108.2.9.1, 1108.3, 1108.4, 1108.4.1.1, 1108.4.1.2, 1108.4.1.4, 1108.4.1.5, 1109.1, 1109.2, 1109.2.1.1, 1109.2.2, 1109.2.3, 1109.3, 1109.4, 1109.5.3, 1109.6.1, 1109.7, 1109.8, 1109.13, 1109.15, 1109.16, 1110.4, 1110.4.2, 3001.3, E101.2, E104.2, E104.2.1, E104.3, E104.3.4, E105.1, E105.2.1, E105.2.2, E105.3, E105.4, E105.5, E105.6, E106.2, E106.3, E106.4, E106.4.9, E106.5, E107.2, E107.3, E109.2.1, E109.2.2.1, E109.2.2.2, E109.2.2.3, E109.2.3, E109.2.5, E109.2.6, E109.2.8, E112.4, P101.1, P102.1, P102.2, P102.3, P102.4, P102.6, P102.8.3, P102.8.5, P102.8.6, P102.9.1, P102.9.1.1, P102.9.2, P102.9.2.1, P103.4
ICC 300—07	ICC Standard on Bleachers, Folding and Telescopic Seating, and Grandstands . . . . .	1028.1, 1028.14.2
ICC 400—07	Standard on Design and Construction of Log Structures . . . . .	2301.2
ICC 500—08	ICC/NSSA Standard on the Design and Construction of Storm Shelters. . . . .	423.1, 423.2
ICC 600—08	Standard for Residential Construction in High Wind Regions. . . . .	1609.1.1.1, 2308.2.1
SBCCI SSTD 11—97	Test Standard for Determining Wind Resistance of Concrete or Clay Roof Tiles. . . . .	1716.2.1, 1716.2.2

### ISO

International Organization for Standardization  
180 Central Secretariat  
1ch, de la Voie-Creuse, Case Postale 56  
CH-1211 Geneva 20, Switzerland

Standard reference number	Title	Referenced in code section number
ISO 8115—86	Cotton Bales-Dimensions and Density. . . . .	Table 415.8.2.1.1
ISO 8115-3—95	Bales-Part 3: Bales of Cotton-Packaging and Labeling . . . . .	Table 307.1(1)

### NAAMM

National Association of Architectural Metal Manufacturers  
800 Roosevelt Road, Bldg. C, Suite 312  
Glen Ellyn, IL 60137

Standard reference number	Title	Referenced in code section number
FP 1001—97	Guide Specifications for Design of Metal Flag Poles. . . . .	1609.1.1

### NCMA

National Concrete Masonry Association  
13750 Sunrise Valley  
Herndon, VA 22071-4662

Standard reference number	Title	Referenced in code section number
TEK 5—84 (1996)	Details for Concrete Masonry Fire Walls. . . . .	Table 720.1(2)



National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169-7471

Standard reference number	Title	Referenced in code section number
13—07*	Installation of Sprinkler Systems . . . . .	705.8.2, 708.2, 901.1.1, Table 903.2.11.10, 903.3.1.1, 903.3.2, 903.3.5.1, 903.3.5.1.1, 903.3.5.2, 905.3.3.1, 907.6.3, 1704.2.3.1, K4-2.8.3.3 Q101.1, Q102.1, Q103.1, Q104.1, Q105.1
13D—07*	Installation of Sprinkler Systems in One- and Two-family Dwellings and Manufactured Homes . . . . .	901.1.1, 903.3.1.3, 903.3.5.1.1, Q101.1, Q102.1, Q103.1
13R—07*	Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height . . . . .	903.1.1, 903.3.1.2, 903.3.5.1.1, 903.3.5.1.2, 903.4, Q101.1, Q102.1, Q104.1
14—07*	Installation of Standpipe and Hose System . . . . .	403.3.2, 901.1.1, 905.2, 905.3.3.3, 905.4.2, 905.6.2, 905.8, 1704.2.4.1, 3202.2.5, 3303.8.1, Q101.1, Q102.1, Q105.1
20—07*	Installation of Stationary Pumps for Fire Protection . . . . .	901.1.1, 913.1, 913.2, 913.2.1, 913.5, Q101.1, Q105.1, Q106.1
22—08	Standard for Water Tanks for Private Fire Protection . . . . .	Q105.1
24—10	Standard for the Installation of Private Fire Service Mains and their Appurtenances . . . . .	Q102.1
25—11	Standard for the Inspection, Testing, and Maintenance of Water-based Fire Protection Systems . . . . .	Q102.1
30—08	Flammable and Combustible Liquids Code . . . . .	415.3
31—06	Installation oil Oil-burning Equipment . . . . .	2113.15
32—07	Dry-cleaning Plants . . . . .	415.6.4
40—07	Storage and Handling of Cellulose Nitrate Motion Picture Film . . . . .	409.1
45—04	Standard on Fire Protection for Laboratories Using Chemicals . . . . .	424.2, 424.7.1
54—06	National Fuel Gas Code . . . . .	2113.1
58—08	Liquefied Petroleum Gas Code . . . . .	415.6.3
61—08	Prevention of Fires and Dust Explosions in Agricultural and Food Product Facilities . . . . .	415.6.1
69—08	Standard on Explosion Prevention Systems . . . . .	415.6.1
72—10*	National Fire Alarm Code . . . . .	505.4, 901.1.1, 901.6, 903.4.1, 904.3.5, 907.1, 907.2, 907.2.1.1, 907.2.2, 907.2.7, 907.2.11, 907.2.13.3, 907.3, 907.3.3, 907.3.4, 907.5.2.1.2, 907.5.2.2, 907.6, 907.6.1, 907.6.5, 907.7, 907.7.1, 907.7.2, 909.16, 911.1.5, 917.1, 3007.7, Q101.1, Q102.1
80—07	Fire Doors and Other Opening Protectives . . . . .	410.3.5, 509.4.2, 715.4, 1008.1.4.3, 715.4.6, 715.4.7.1, 715.4.8.2, 715.5, 715.5.5
5—07	Boiler and Combustion System Hazards Code . . . . .	415.6.1
92B—05	Smoke Management Systems in Malls, Atria and Large Spaces . . . . .	909.8
99—05	Standard for Health Care Facilities . . . . .	407.9, 908.8
99C—05	Standard on Gas and Vacuum Systems . . . . .	908.8
101—06	Life Safety Code . . . . .	1028.6.2
105—07	Standard for the Installation of Smoke Door Assemblies . . . . .	405.4.2, 711.5.2, 715.4.3.1, 909.20.4.1
110—05	Emergency and Standby Power Systems . . . . .	1704.31, 2702.1
111—05	Stored Electrical Energy Emergency and Standby Power Systems . . . . .	1704.31, 2702.1
120—04	Coal Preparation Plants . . . . .	415.6.1
170—06	Standard for Fire Safety and Emergency Symbols . . . . .	1024.2.6.2, 1024.3.1, 1024.6.1
211—10	Chimneys, Fireplaces, Vents and Solid Fuel-burning Appliances . . . . .	2112.5
252—03	Standard Methods of Fire Tests of Door Assemblies . . . . .	715.3, 715.4.1, 715.4.2, 715.4.3, 715.4.7.3.1
253—06	Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source . . . . .	402.12.1, 406.6.4, 804.2, 804.3
255—06	Standard Method of Test Surface Burning Characteristics of Building Materials . . . . .	K1-2.14.2.1.1, K1-2.15.8, K4-2.14.2.1.1
257—07	Standard for Fire Test for Window and Glass Block Assemblies . . . . .	715.3, 715.4.3.2, 715.5, 715.5.1, 715.5.2, 715.5.9.1
259—03	Test Method for Potential Heat of Building Materials . . . . .	2603.4.1.10, 2603.5.3
265—07	Method of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings on Full Height Panels and Walls . . . . .	803.1.3.1
268—07	Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source . . . . .	1406.2.1, 1406.2.1.1, 1406.2.1.2, 2603.5.7
269—12	Standard Test Method for Developing Toxic Potency Data for Use in Fire Hazard Modeling . . . . .	803.5
285—06	Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-load-bearing Wall Assemblies Containing Combustible Components . . . . .	1407.10.3, 2603.5.5
286—06	Standard Method of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth . . . . .	403.16.4 803.1.2, 803.1.2.1, 2603.4, 2603.9, 2604.2.4, 2613.4
288—07	Standard Method of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire-resistance-rated Floor Systems . . . . .	712.8
409—04	Aircraft Hangers . . . . .	412.4.6, Table 412.4.6, 412.4.6.1, 412.6.5
418—06	Standard for Heliports . . . . .	412.7.4
484—06	Combustible Metals . . . . .	415.6.1
651—98	Machining and Finishing of Aluminum and the Production and Handling of Aluminum Powders . . . . .	415.6.1
654—06	Prevention of Fire & Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids . . . . .	415.6.1
655—07	Prevention of Sulfur Fires and Explosions . . . . .	415.6.1
664—07	Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities . . . . .	415.6.1
701—10	Standard Methods of Fire Tests for Flame-propagation of Textiles and Films . . . . .	402.12.1, 801.4, 3102.3.1, 3102.6.1.1, 3105.3, 3308.3.4, 3314.8.2, 3315.1.6, 3315.2.3, H114.2, H114.2.2, H117.4
704—07	Standard System for the Identification of the Hazards of Materials for Emergency Response . . . . .	414.7.2, 415.2, 424.4
1124—06	Manufacture, Transportation, and Storage of Fireworks and Pyrotechnic Articles . . . . .	415.3.1

\* As modified in Appendix Q



## REFERENCED STANDARDS

**NIST/NBS** National Institute of Standards and Technology  
U.S. Department of Commerce  
100 Bureau Dr. - Stop 3460  
Gaithersburg, MD 20899-3460

Standard reference number	Title	Referenced in code section number
BMS 71—41	Fire Tests of Wood and Metal-framed Partitions . . . . .	721.7
TRBM 44—46	Fire-resistance and Sound-insulation Ratings for Walls, Partitions and Floors . . . . .	721.7

**PCI** Precast Prestressed Concrete Institute  
209 W. Jackson Boulevard, Suite 500  
Chicago, IL 60606-6938

Standard reference number	Title	Referenced in code section number
MNL 124—89	Design for Fire Resistance of Precast Prestressed Concrete. . . . .	721.2.3.1
MNL 128—01	Recommended Practice for Glass Fiber-reinforced Concrete Panels. . . . .	1903.8

**RMI** Rack Manufacturers Institute  
8720 Red Oak Boulevard, Suite 201  
Charlotte, NC 28217

Standard reference number	Title	Referenced in code section number
ANSI MH 16.1—08	Specification for Design, Testing and Utilization of Industrial Steel Storage Racks . . . . .	2208.1

**SDI** Steel Deck Institute  
P.O. Box 25  
Fox River Grove, IL 60021

Standard reference number	Title	Referenced in code section number
ANSI/NC 1.0—06	Standard for Noncomposite Steel Floor Deck . . . . .	2209.2.2, 2209.2.2.1
ANSI/RD 1.0—06	Standard for Steel Floor Deck . . . . .	2209.2.3

**SJI** Steel Joist Institute  
1173B London Links Drive  
Forest, VA 24551

Standard reference number	Title	Referenced in code section number
CJ-1.0—06	Standard Specification for Composite Steel Joists, CJ-series. . . . .	1604.3.3, 2203.2, 2206.1
JG-1.1—05	Standard Specification for Joist Girders . . . . .	1604.3.3, 2203.2, 2206.1
K-1.1—05	Standard Specification for Open Web Steel Joists, K-series . . . . .	1604.3.3, 2203.2, 2206.1
LH/DLH-1.1—05	Standard Specification for Longspan Steel Joists, LH-series and Deep Longspan Steel Joists, DLH- series . . . . .	1604.3.3, 2203.2, 2206.1

**SPRI** Single-Ply Roofing Institute  
411 Waverly Oaks Road, Suite 331B  
Waltham, MA 02452

Standard reference number	Title	Referenced in code section number
ES-1—03	Wind Design Standards for Edge Systems Used with Low Slope Roofing Systems. . . . .	1504.5
RP-14—10	Wind Design Standards for Vegetative Roofing Systems . . . . .	1507.16.1
VF-1—10	External Fire Design Standard for Vegetative Roofs . . . . .	1507.16.1
RP-4—02	Wind Design Guide for Ballasted Single-ply Roofing Systems. . . . .	1504.4

# TIA

Telecommunications Industry Association  
2500 Wilson Boulevard  
Arlington, VA 22201-3834

Standard reference number	Title	Referenced in code section number
TIA-222-G—05	Structural Standards for Steel Antenna Towers and Antenna Supporting Structures . . . . .	1609.1.1, 3108.1, 3108.2, 3108.4

# TMS

The Masonry Society  
3970 Broadway, Unit 201-D  
Boulder, CO 80304-1135

Standard reference number	Title	Referenced in code section number
0216—97	Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies . . . . .	Table 720.1(2), 721.1
302—07	Standard Method for Determining the Sound Transmission Class for Masonry Walls . . . . .	1207.2.1
402—08	Building Code Requirements for Masonry Structures . . . . .	1405.6, 1405.6.2, 1405.10, 1604.3.4, 1704.5.1, Table 1704.5.1, 1704.5.2, 1704.5.3, Table 1704.5.3, 2101.2.2, 2101.2.3, 2101.2.4, 2101.2.5, 2101.2.6, 2104.2, 2106.1, 2107.1, 2107.2, 2107.3, 2107.4, 2107.5, 2108.1, 2108.2, 2108.3, 2109.1, 2109.1.1, 2109.2, 2109.2.1, 2110.1
602—08	Specification for Masonry Structures . . . . .	Table 1704.5.1, Table 1704.5.3, 2103.8, 2103.11, 2103.12, 2103.13, 2104.1, 2104.1.1, 2104.1.2, 2104.1.3, 2104.3, 2104.4, 2104.6, 2105.2.2.1.1, 2105.2.2.1.2, 2105.2.2.1.3, 2105.4

# TPI

Truss Plate Institute  
218 N. Lee Street, Suite 312  
Alexandria, VA 22314

Standard reference number	Title	Referenced in code section number
TPI 1—2007	National Design Standards for Metal-plate connected Wood Truss Construction . . . . .	2303.4.6, 2306.1

# UL

Underwriters Laboratories  
333 Pfingsten Road  
Northbrook, IL 60062-2096

Standard reference number	Title	Referenced in code section number
9—2000	Fire Tests of Window Assemblies—with Revisions through April 2005 . . .	715.3, 715.4.3.2, 715.5, 715.5.1, 715.5.2, 715.5.9.1
10A—98	Tin Clad Fire Doors—with Revisions through March 2003 . . . . .	715.4
10B—97	Fire Tests of Door Assemblies—with Revisions through October 2001 . . . . .	715.4.2
10C—98	Positive Pressure Fire Tests of Door Assemblies—with Revisions thru November 2001 . . . . .	715.4.1, 715.4.3, 1008.1.10.1
14B—98	Sliding Hardware for Standard Horizontally-mounted Tin Clad Fire Doors—with Revisions through July, 2000 . . . . .	715.4
14C—06	Swinging Hardware for Standard Tin Clad Fire Doors Mounted Singly and in Pairs . . . . .	715.4
103—01	Factory-built Chimneys, for Residential Type and Building Heating Appliances—with Revisions through June 2006 . . . . .	716.2.5.1
127—96	Factory-built Fireplaces—with Revisions through November 2006 . . . . .	717.2.5.1
214—01	Standard for Tests for Flame-propagation of Fabrics and Films . . . . .	H114.2, H117.4
217—06	Single-and Multiple-station Smoke Alarms—with Revisions through August 2005 . . . . .	907.2.11
263—03	Standard for Fire Test of Building Construction and Materials . . . . .	607.5.5, 703.2, 703.2.1, 703.2.3, 703.3, 703.5, 704.12, 705.7, 705.8.5, 707.6, 712.3.2, 713.3.1, 713.4.1.1, 714.1, 715.2, 715.4.5, 716.5.2, 716.5.3, 716.6.1, 716.6.2.1, Table 720.1(1), 1407.10.2, 2103.2, 2603.4, 2603.5.1
268—06	Smoke Detectors for Fire Protective Signaling Systems—with Revisions through January 1999 . . . . .	407.7
300—05	Fire Testing of Fire Extinguishing Systems for Protection of Restaurant Cooking Areas . . . . .	904.11
305—07	Panic Hardware . . . . .	1008.1.10.1
325—02	Door Drapery, Gate, Louver and Window Operations and Systems—with Revisions through February 2006 . . . . .	406.1.5, 3110.3.1, 3110.4
555—06	Fire Dampers . . . . .	716.3.1
555C—06	Ceiling Dampers . . . . .	716.3.1
555S—99	Smoke Dampers—with Revisions through July 2006 . . . . .	716.3.1
580—06	Test for Uplift Resistance of Roof Assemblies—with Revisions through February 1998 . . . . .	1504.3.1, 1504.3.2
641—95	Type L Low-Temperature Venting Systems—with Revisions through April 1999 . . . . .	
723—03	Standard for Test for Surface-burning Characteristics of Building Materials—with Revisions through May 2005 . . . . .	402.11, 703.4.2, 719.1, 802.1, 803.1, 803.1.1, 803.1.2, 803.1.4, 803.1.4.1, 806.5, 1407.9, 1407.10.1, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2604.2.4, 2606.4, 2613.3, K1-2.14.2.1.1, K1-2.15.8, K4-2.14.2.1
790—04	Standard Test Methods for Fire Tests of Roof Coverings . . . . .	1505.1, 2603.6, 2610.2, 2610.3
793—03	Standards for Automatically Operated Roof Vents for Smoke and Heat—with Revisions through April 2004 . . . . .	910.3.1
864—03	Standards for Control Units and Accessories for Fire Alarm Systems—with Revisions through March 2006 . . . . .	909.12, 909.12.3.1
924—06	Standard for Safety Emergency Lighting and Power Equipment . . . . .	1011.4

## REFERENCED STANDARDS

### UL—continued

1040—96	Fire Test of Insulated Wall Construction—with Revisions thru June 2001 . . . . .	1407.10.2, 2603.4, 2603.9
1256—02	Fire Test of Roof Deck Construction—with Revisions through January 2007 . . . . .	1508.1, 2603.3, 2603.4.1.5
1275—05	Flammable Liquid Storage Cabinets . . . . .	424.4
1479—03	Fire Tests of Through-penetration Firestops— with Revisions through April 2007 . . . . .	702.1, 713.3.1.2, 713.3.2, 713.4.1.1.2, 713.5
1482—96	Solid Fuel-type Room Heater—with Revisions through November 2006 . . . . .	2112.2, 2112.5
1703—08	Flat-plate Photovoltaic Modules and Panels . . . . .	1508.1
1715—97	Fire Test of Interior Finish Material—with Revisions through March 2004 . . . . .	1407.10.2
1777—04	Chimney Liners . . . . .	2113.11.1, 2113.19
1784—01	Air Leakage Tests of Door Assemblies—with Revisions through December 2004 . . . . .	708.14.1, 711.5.2, 715.4.3.1, 715.4.6.1, 715.4.6.3, 1014.4.1, 1014.4.2, 3007.6, 3007.6.3, 3008.7.3
1897—04	Uplift Tests for Roof Covering Systems . . . . .	1504.3.1
1975—06	Fire Test of Foamed Plastics Used for Decorative Purposes . . . . .	402.11, 402.12.1, 402.16.5
1994—04	Standard for Luminous Egress Path Marking Systems— with Revisions through February 2005 . . . . .	411.7, 1024.2.4, 1024.4
2017—00	Standards for General-purpose Signaling Devices and Systems— with Revisions through August 2005 . . . . .	3109.5.1.8
2034—08	Standard for Single and Multiple Station Carbon Monoxide Alarms . . . . .	908.7.3
2075—07	Standard for Gas and Vapor Detectors and Sensors . . . . .	908.7.3
2079—04	Tests for Fire Resistance of Building Joint Systems— with Revisions through March 2006 . . . . .	702.1, 714.3, 714.6
2196—11	Test for Fire Resistive Cables . . . . .	909.20.6.1
2200—04	Stationary Engine Generator Assemblies—with Revisions through July 2004 . . . . .	2702.1.2

## USC

United States Code  
c/o Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
18 USC Part 1, Ch. 40	Importation, Manufacture, Distribution and Storage of Explosive Materials . . . . .	307.2

## WDMA

Window and Door Manufacturers Association  
1400 East Touhy Avenue #470  
Des Plaines, IL 60018

Standard reference number	Title	Referenced in code section number
AAMA/WDMA/CSA 101/I.S.2/A440—08	Specifications for Windows, Doors and Unit Skylights . . . . .	1715.5.1, 2405.5

# APPENDIX A RESERVED

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# APPENDIX B RESERVED





# APPENDIX C RESERVED







## APPENDIX D

# FIRE DISTRICTS

### SECTION BC D101 GENERAL

**D101.1 Scope.** The provisions of this appendix shall regulate the division of the city of New York into geographical territories known as fire districts and control the occupancy groups and construction classes permitted in the fire districts. Wherever reference is made to the fire district, it shall be construed to mean the fire districts designated and referred to in this appendix.

**D101.2 Establishment of fire district.** The following city areas are hereby established as being inside the fire districts:

1. All of the borough of Manhattan.
2. All of the borough of Bronx.
3. All of the borough of Brooklyn.
4. Such portions of the boroughs of Staten Island and Queens as are indicated on the "fire district maps" as per Section D106.

### SECTION BC D102 BUILDING RESTRICTIONS

**D102.1 Types of construction permitted.** Every building hereafter erected within the fire district, or located partially in the fire district pursuant to Section D104. 1, shall be either Type I, II, III or IV.

#### D102.2 Other specific requirements.

**D102.2.1 Group H-1 prohibited.** Group H-1 occupancies shall be prohibited from location within the fire district.

**D102.2.2 Construction type.** Every building, room, or space hereafter altered or erected shall be constructed as required based on the type of construction indicated in Chapter 6 except as provided in Section D102.2.4.

**D102.2.3 Roof covering.** Roof covering in the fire district shall conform to the requirements of Class A or B roof coverings as defined in Section 1505.

**D102.2.4 Structural fire rating.** The fire-resistance rating of bearing walls, floors, roofs and their supporting structural members shall comply with Table 601 of Chapter 6, but in no event shall such rating be less than 1 hour.

**Exceptions:** The following buildings or building elements may be constructed with fire-resistance rating in accordance with Table 601:

1. Buildings of Type IV construction.
2. Buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.
3. Automobile parking structures. Buildings surrounded on all sides by a permanently open space of not less than 30 feet (9144 mm).

4. Partitions complying with Section 603.1, Item 11.

**D102.2.5 R-1 and R-2 occupancies.** No building or space classified in Occupancy Group R-1 or R-2 may be located on a lot containing a building classified in construction Type IIB, VA or VB.

### SECTION BC D103 CHANGES TO BUILDINGS

**D103.1 Existing buildings within the fire district.** An existing building shall not hereafter be increased in height or area unless it is of a type of construction permitted for new buildings within the fire district or is altered to comply with the requirements for such type of construction. Nor shall any existing building be hereafter extended on any side, nor square footage or floors added within the existing building unless such modifications are of a type of construction permitted for new buildings within the fire district.

**D103.2 Other alterations.** Nothing in Section D103.1 shall prohibit other alterations within the fire district provided there is no change of occupancy that is otherwise prohibited and provided the fire hazard is not increased by such alteration.

**D103.3 Moving buildings.** Buildings shall not hereafter be moved into the fire district or to another lot in the fire district unless the building is of a type of construction permitted in the fire district.

### SECTION BC D104 BUILDINGS LOCATED PARTIALLY IN THE FIRE DISTRICT

**D104.1 General.** Any building located partially in the fire district, so that it is both inside and outside the district, shall be of a type of construction required for the fire district if more than 25 percent of the total floor area of the building is located inside the fire district.

### SECTION BC D105 EXCEPTIONS TO RESTRICTIONS IN FIRE DISTRICT

**D105.1 General.** The preceding provisions of this appendix shall not apply in the following instances:

1. Temporary platforms, reviewing stands, and similar miscellaneous structures used for a limited period of time, subject to the approval of the commissioner.
2. Fences not over 6 feet (1829 mm) high.
3. Water towers, tank structures, and trestles may be constructed of wood planking and timbers of dimensions not less than as required for Type IV construction when not over 35 feet (10 668 mm) high and

4. Detached greenhouses accessory to a one- or two-family dwelling located on the same lot at least 6 feet (1829 mm) from any lot line or building walls and not exceeding 14 feet (4267 mm) in height.
5. Porches on dwellings not over one story in height, and not over 10 feet (3048 mm) wide from the face of the building, provided such porch does not come within 5 feet (1524 mm) of any property line.
6. Sheds open on a long side not over 15 feet (4572 mm) high and 500 square feet (46 m<sup>2</sup>) in area.
7. Existing one- and two-family dwellings of a type of construction not permitted in the fire district can be extended 25 percent of the floor area existing at the time of inclusion in the fire district by any type of construction permitted by this code.
8. Wood decks less than 600 square feet (56 m<sup>2</sup>) where constructed of 2-inch (51 mm) nominal wood, pressure treated for exterior use.
9. One- or two-family detached or semidetached dwellings of two stories or less in height and 2,500 square feet (232 m<sup>2</sup>) or less in area located within Zoning Districts R-2 through R-5 may be constructed or reconstructed of construction Type VA, or if damaged for any cause only the damaged portions shall be required to be reconstructed to conform to Type VA construction. In addition, one-family dwellings located within Zoning District R-1 anywhere in the city, may be constructed of Type VB construction in conformance with the area and height limits established by Table 503 of Chapter 5.
10. An accessory building or structure used as an office or similar use for an open parking lot located on the same lot, may be constructed of Type VA or VB construction.

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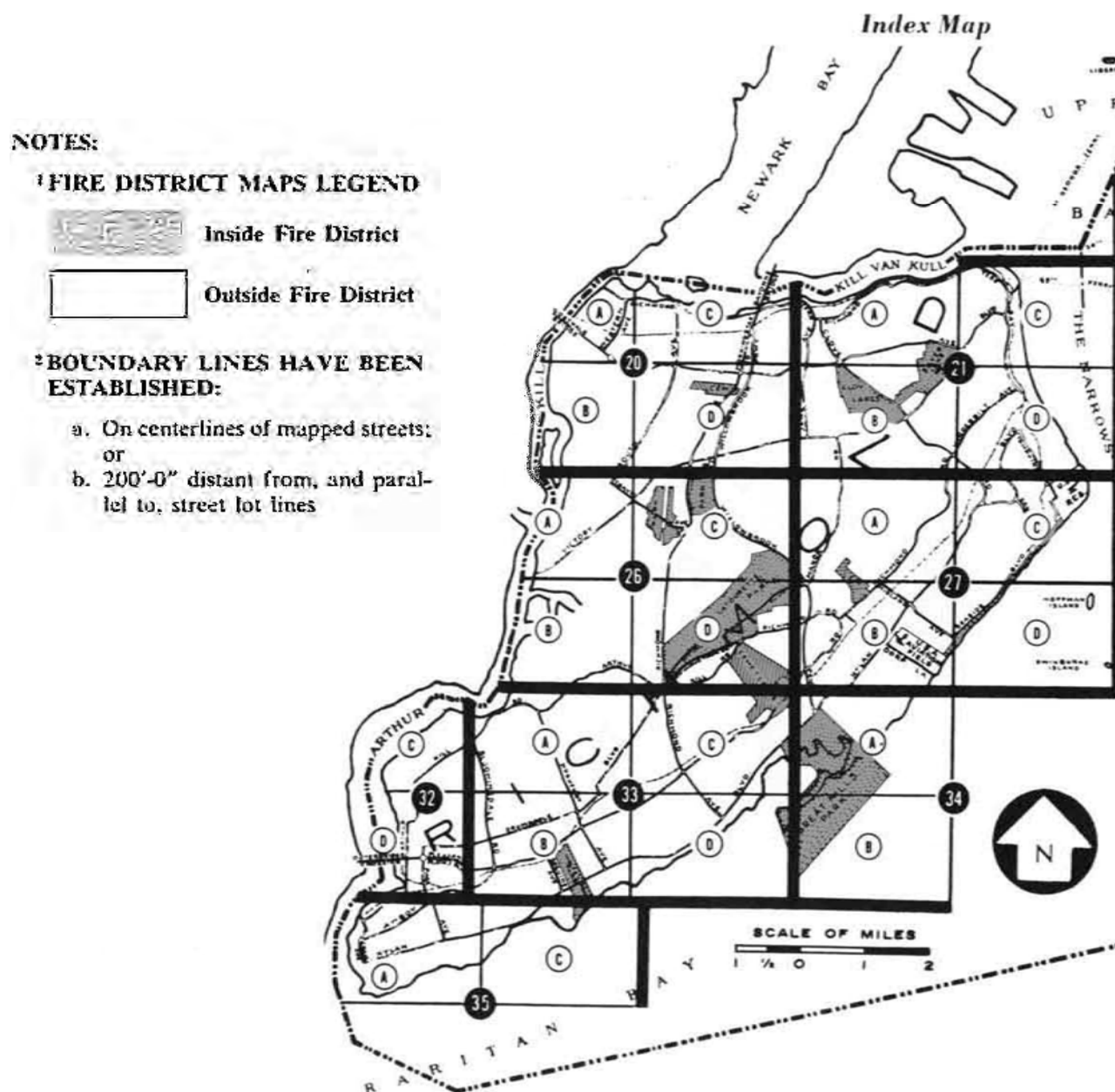
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11. Temporary fences, sidewalk sheds, signs, and other safeguards installed in accordance with Chapter 33.
12. One- or two-family detached, zero lot line or semi-detached dwellings of three stories in height and 2,500 square feet (232 m<sup>2</sup>) or less in area located within Zoning Districts R-1 through R-5 within Lower Density Growth Management Areas as defined by the *New York City Zoning Resolution* may be constructed or reconstructed of construction Type VA where such buildings are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, or if damaged for any cause only the damaged portions shall be required to be reconstructed to conform to Type VA construction where such buildings are equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. In addition, no portion of a one- or two-family detached, zero lot line or semi-detached dwellings located within Zoning Districts R-1, R-2 or R-5 within Lower Density Growth Management Areas shall exceed a maximum building height of 35 feet (10 668 mm)± above the grade plane.

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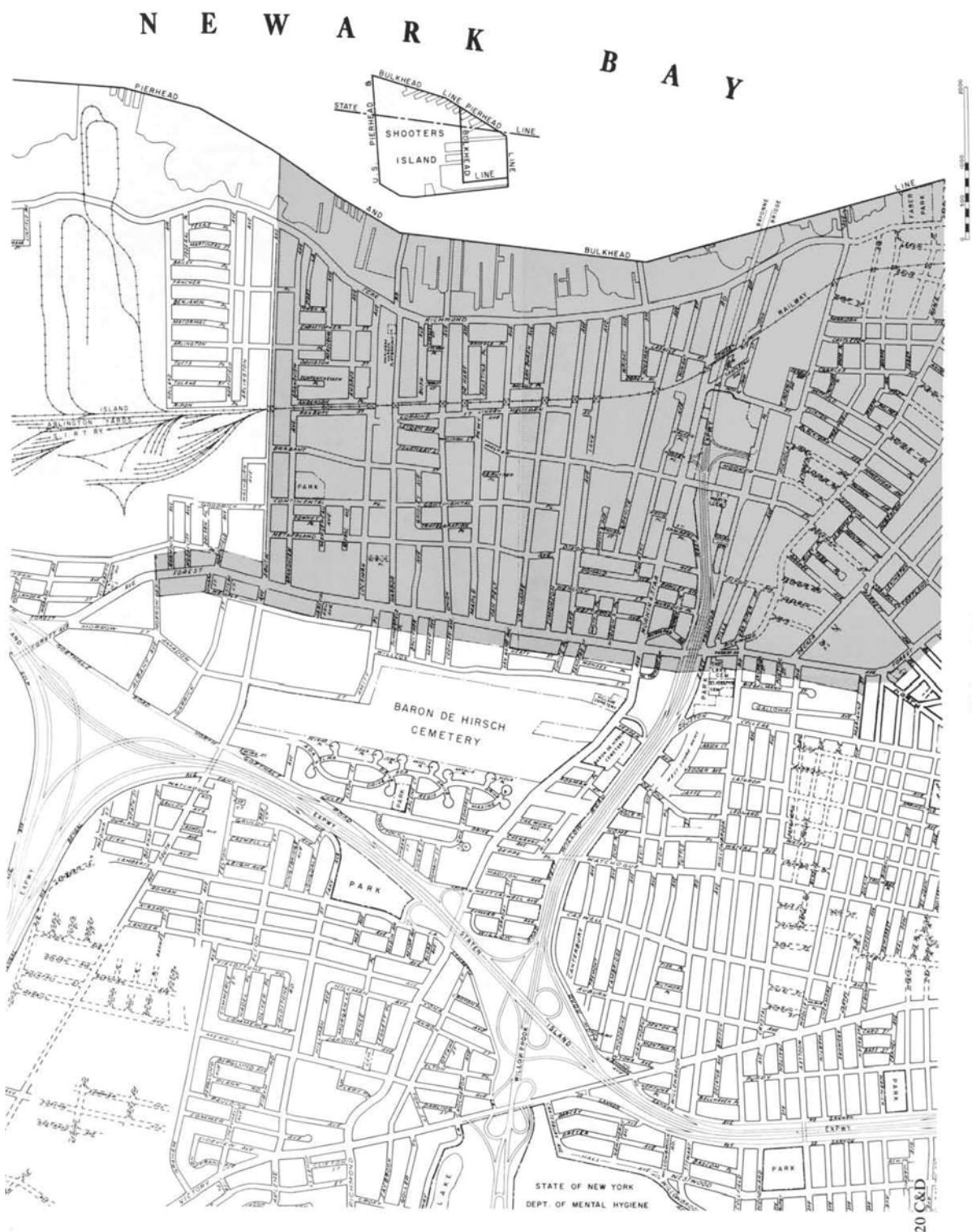
**D106.1 Fire district maps.** Within the boroughs of Richmond and Queens, the fire districts shall comprise such areas indicated on the “fire district maps” in accordance with Figures D106.1(1) and D106.1(2).

[illegible]

**FIGURE D106.1(1)**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF RICHMOND**







**FIGURE D106.1(1)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF RICHMOND**

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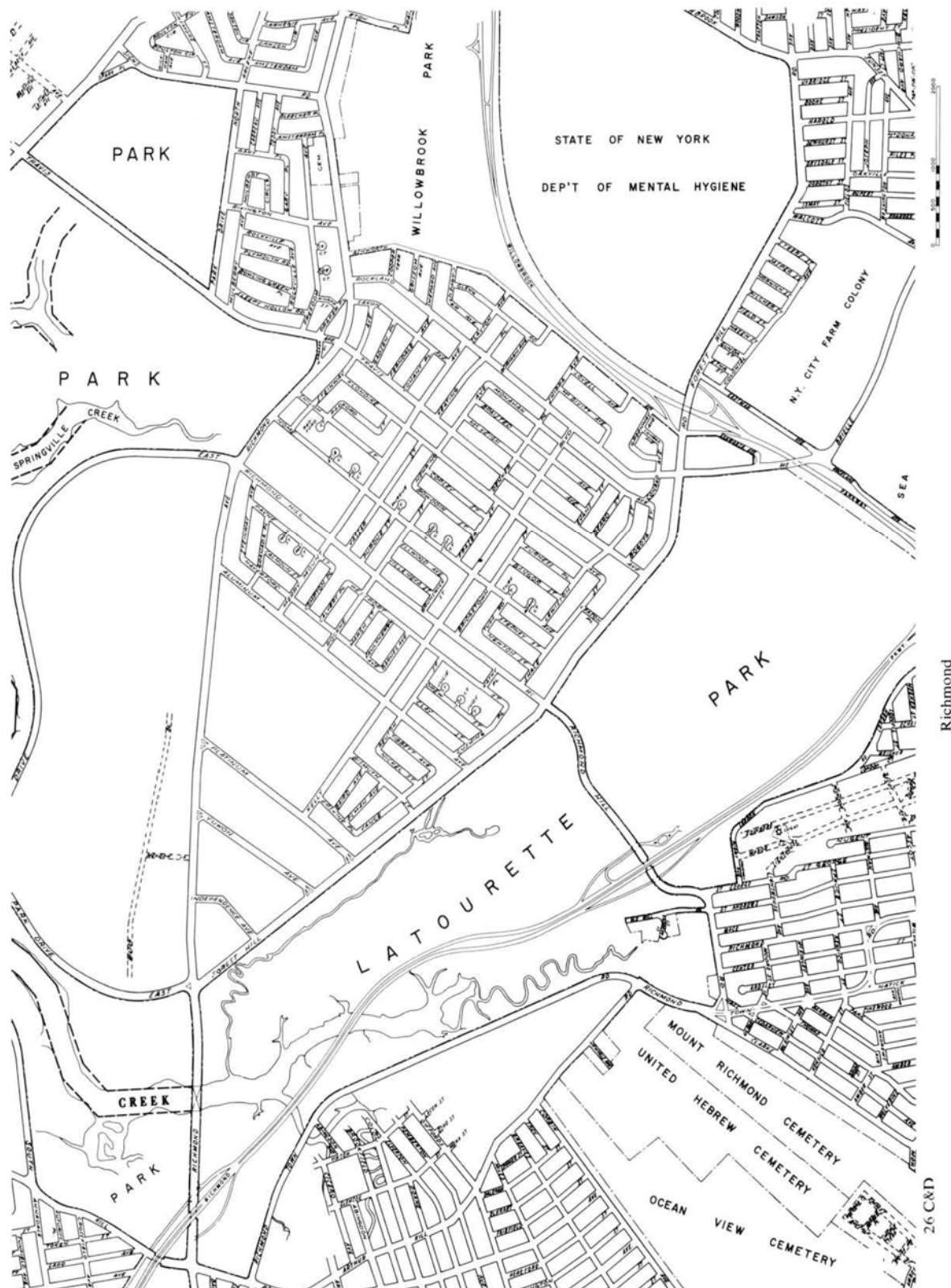
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26 A&amp;B



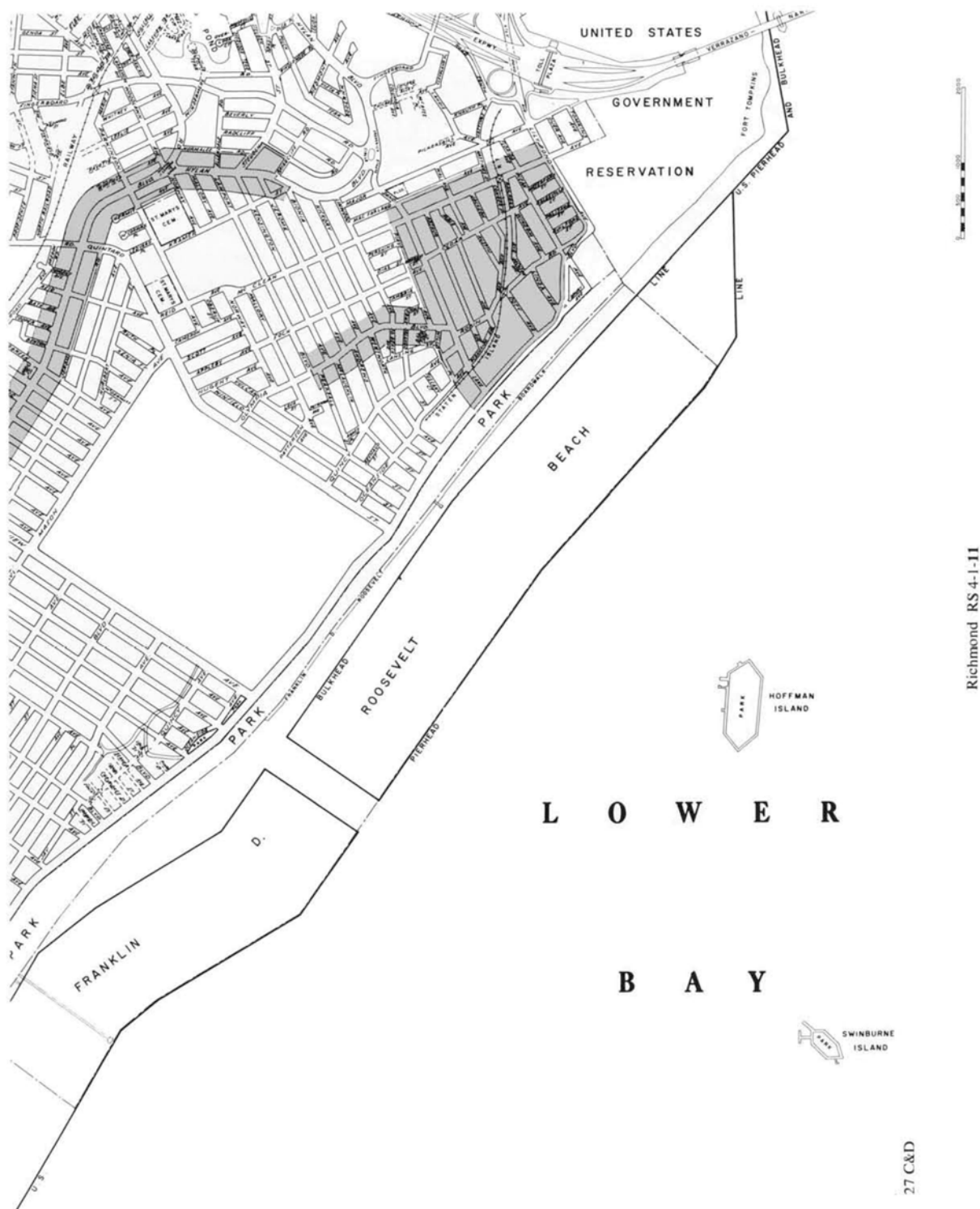
**FIGURE D106.1(1)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF RICHMOND**

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**FIGURE D106.1(1)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF RICHMOND**

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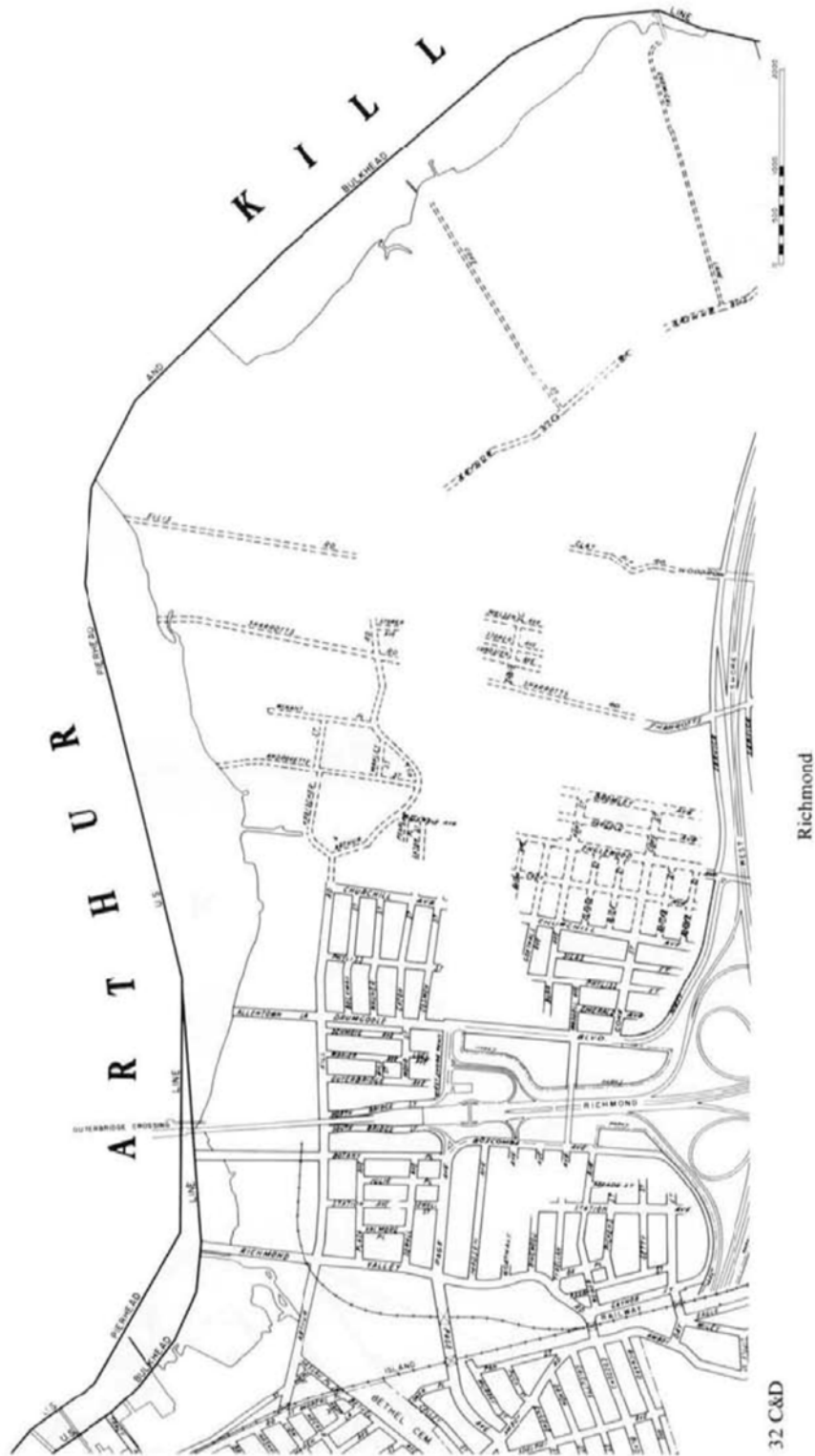


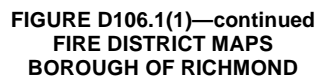
FIGURE D106.1(1)—continued  
FIRE DISTRICT MAPS  
BOROUGH OF RICHMOND



**FIGURE D106.1(1)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF RICHMOND**

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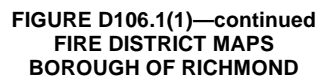


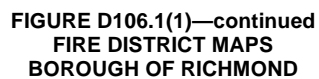




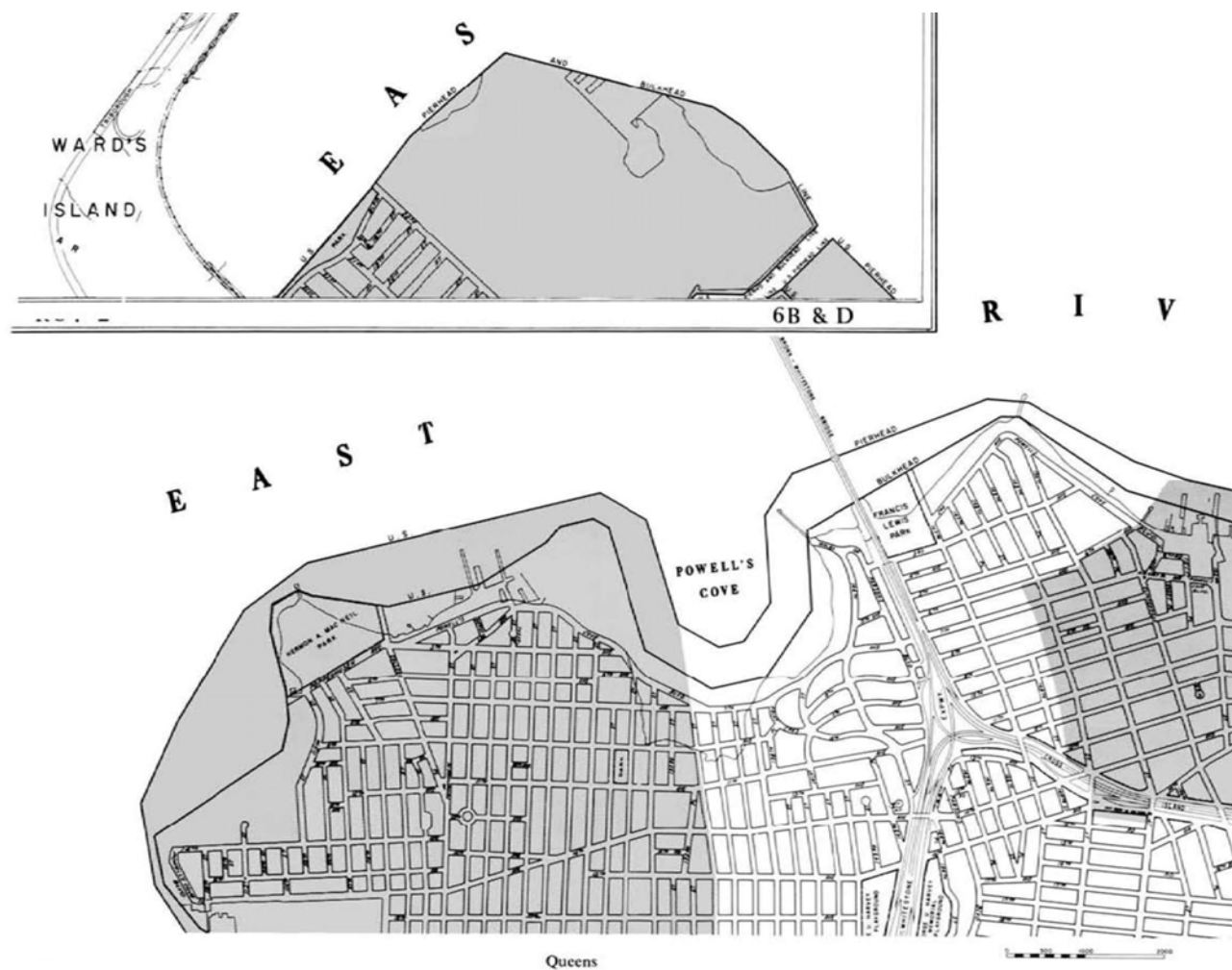
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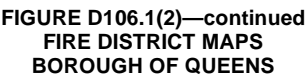


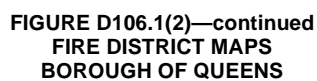


**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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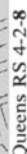






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**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**





**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

[illegible]



11 C&amp;D





**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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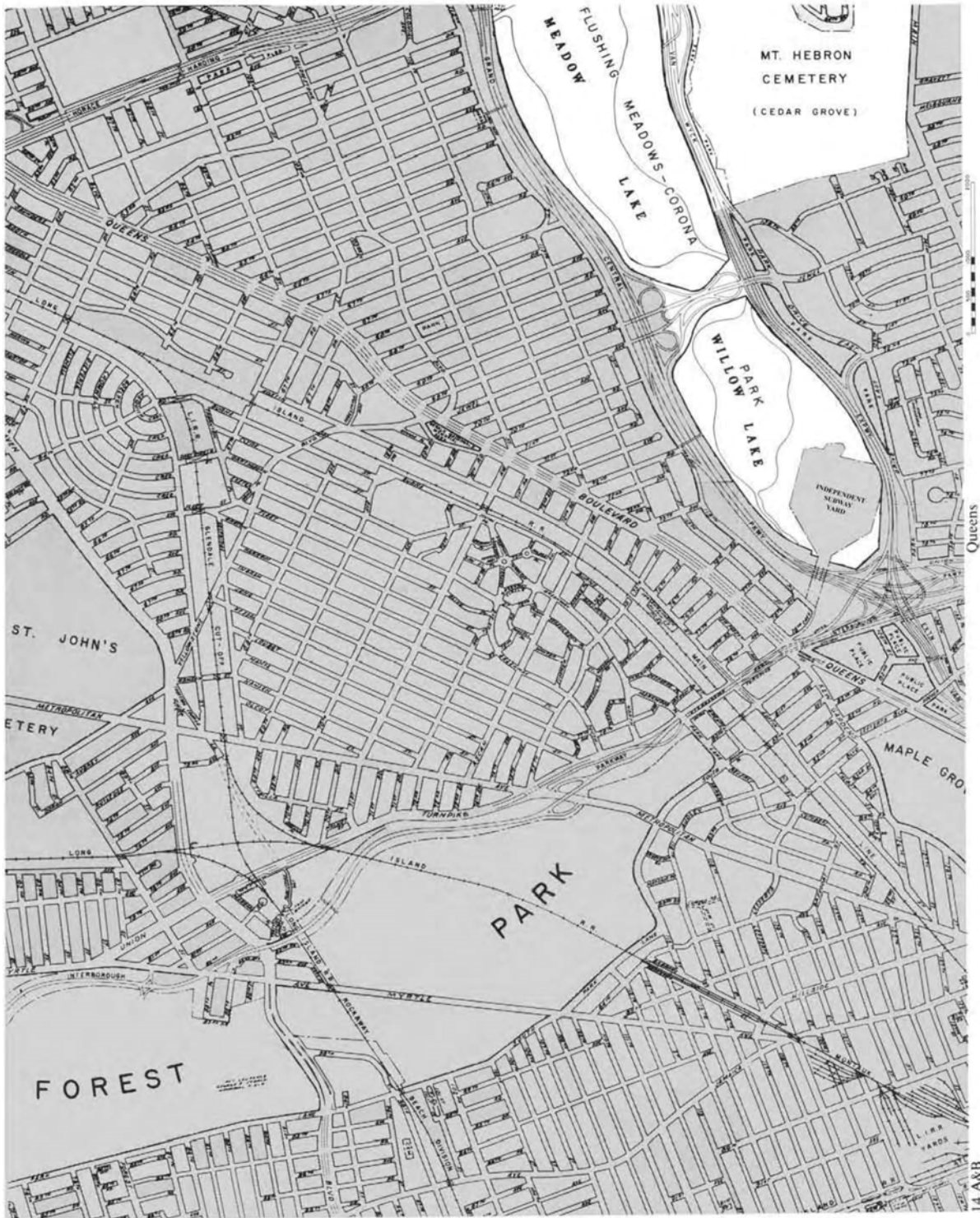


FIGURE D106.1(2)—continued  
FIRE DISTRICT MAPS  
BOROUGH OF QUEENS





14 C&amp;D

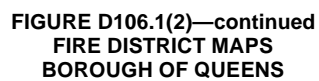


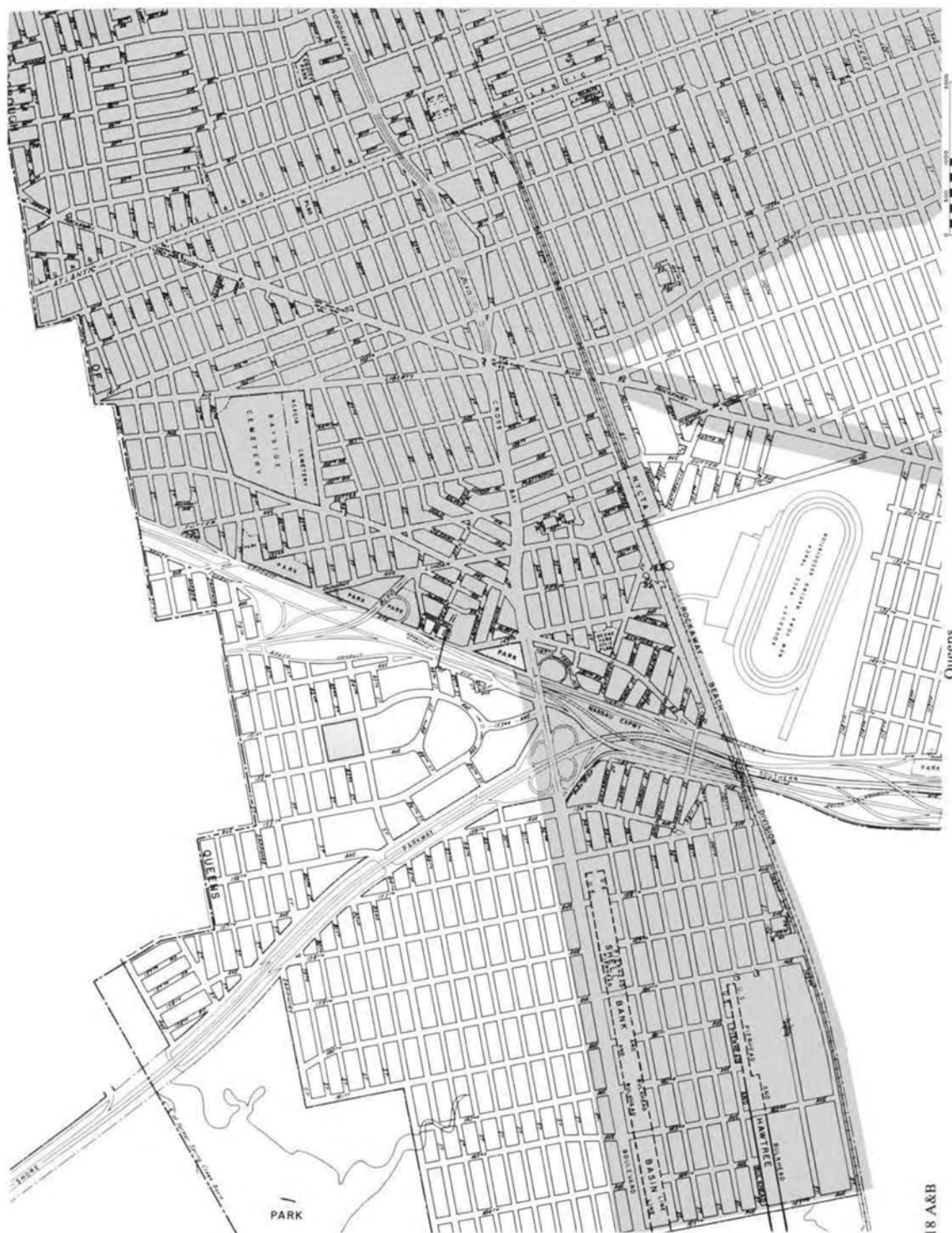


**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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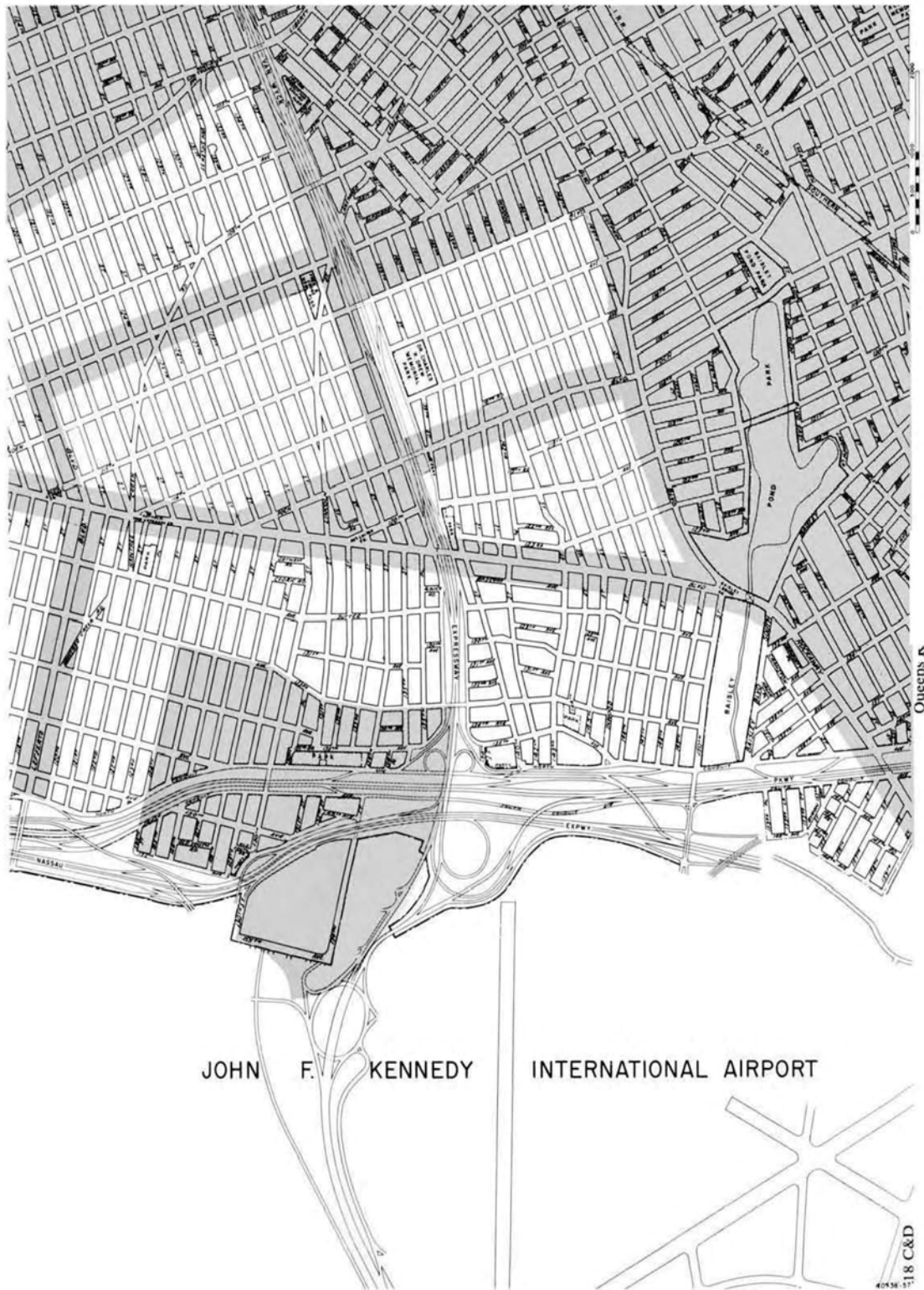




**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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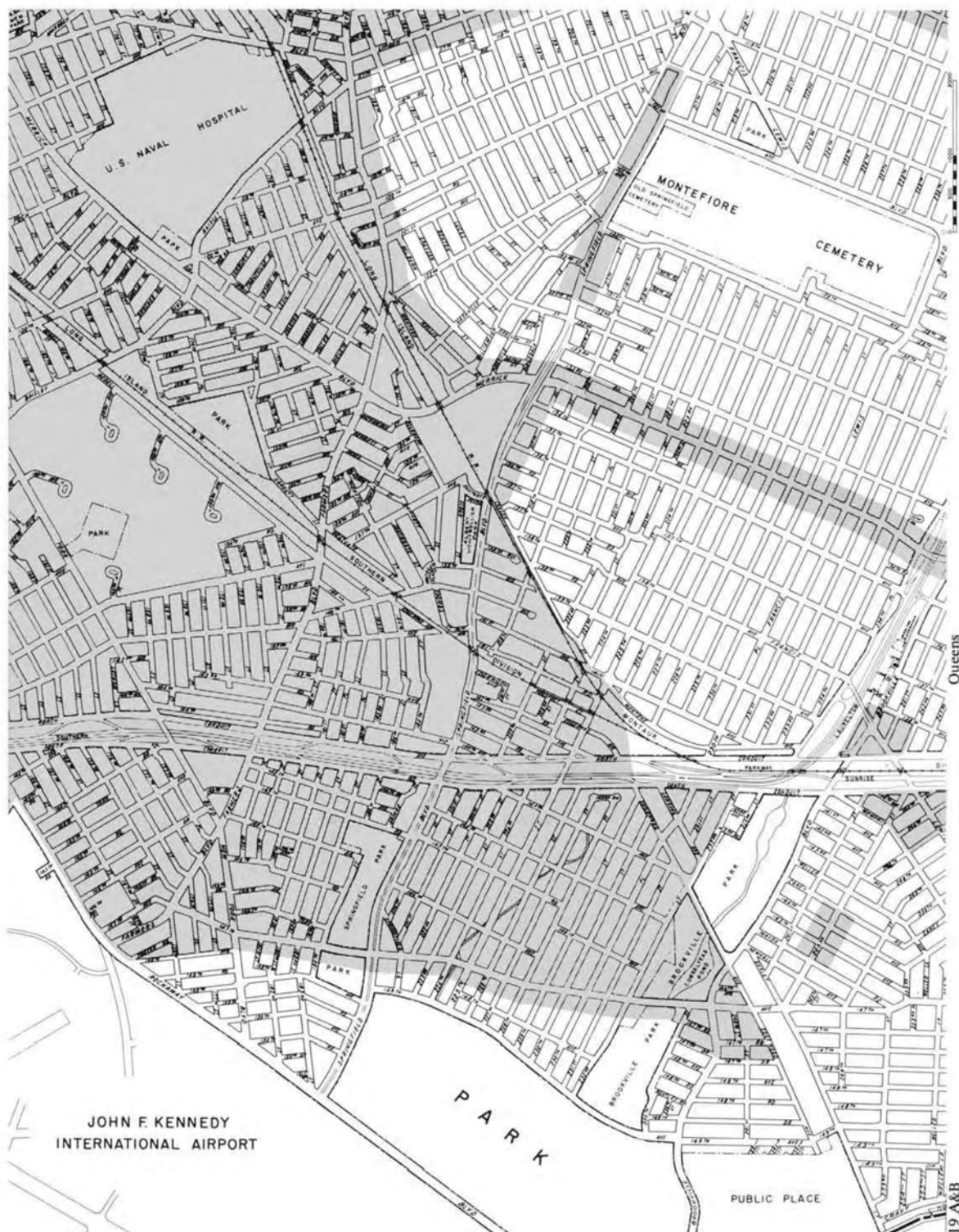




**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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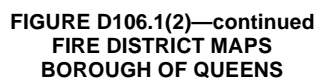


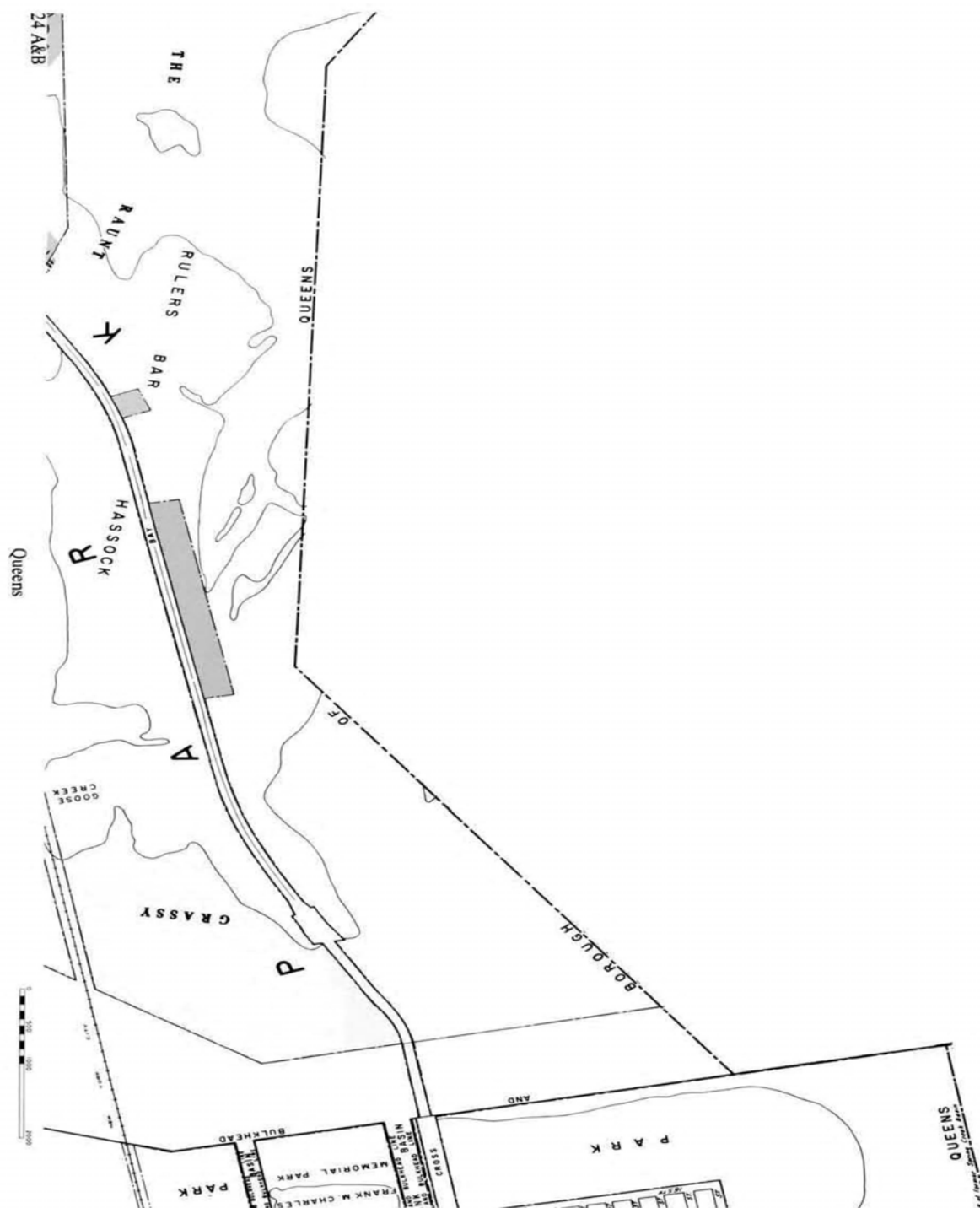


**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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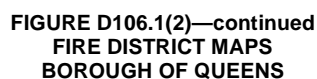






**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**



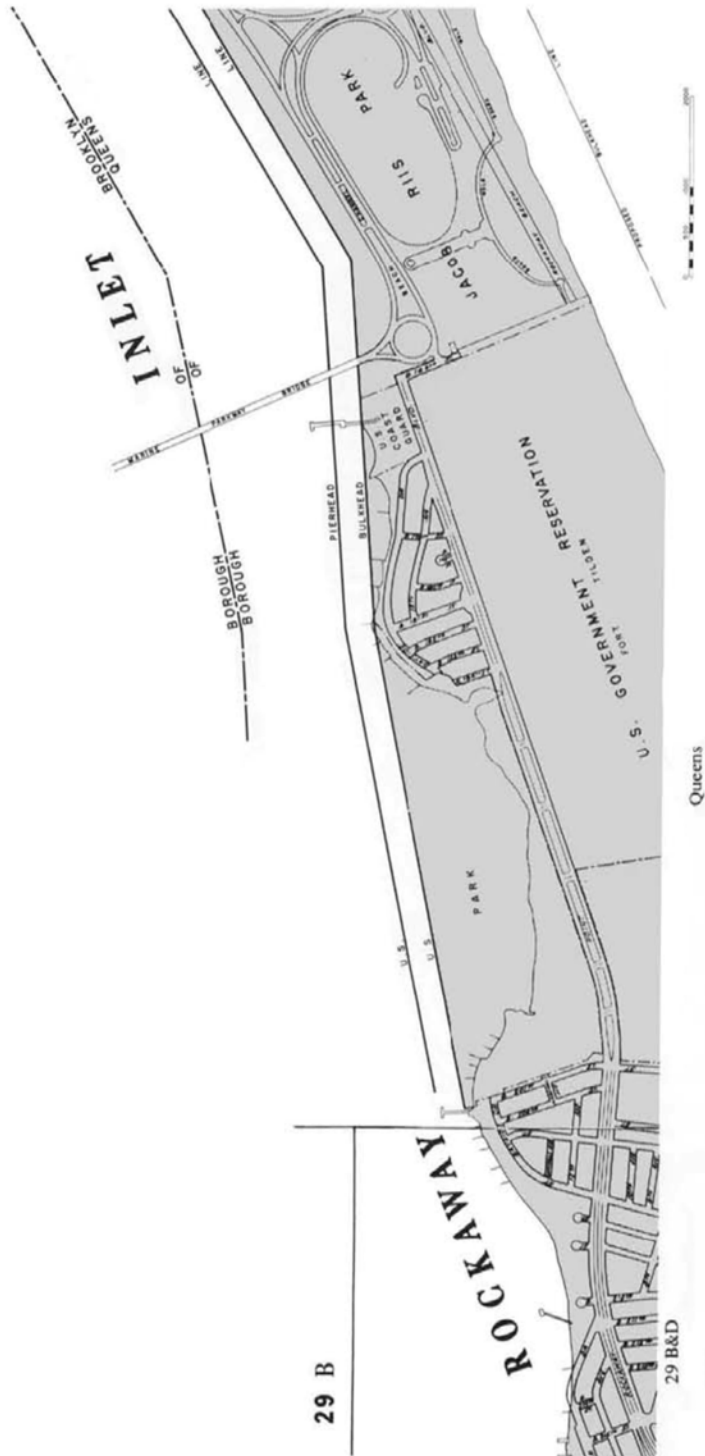
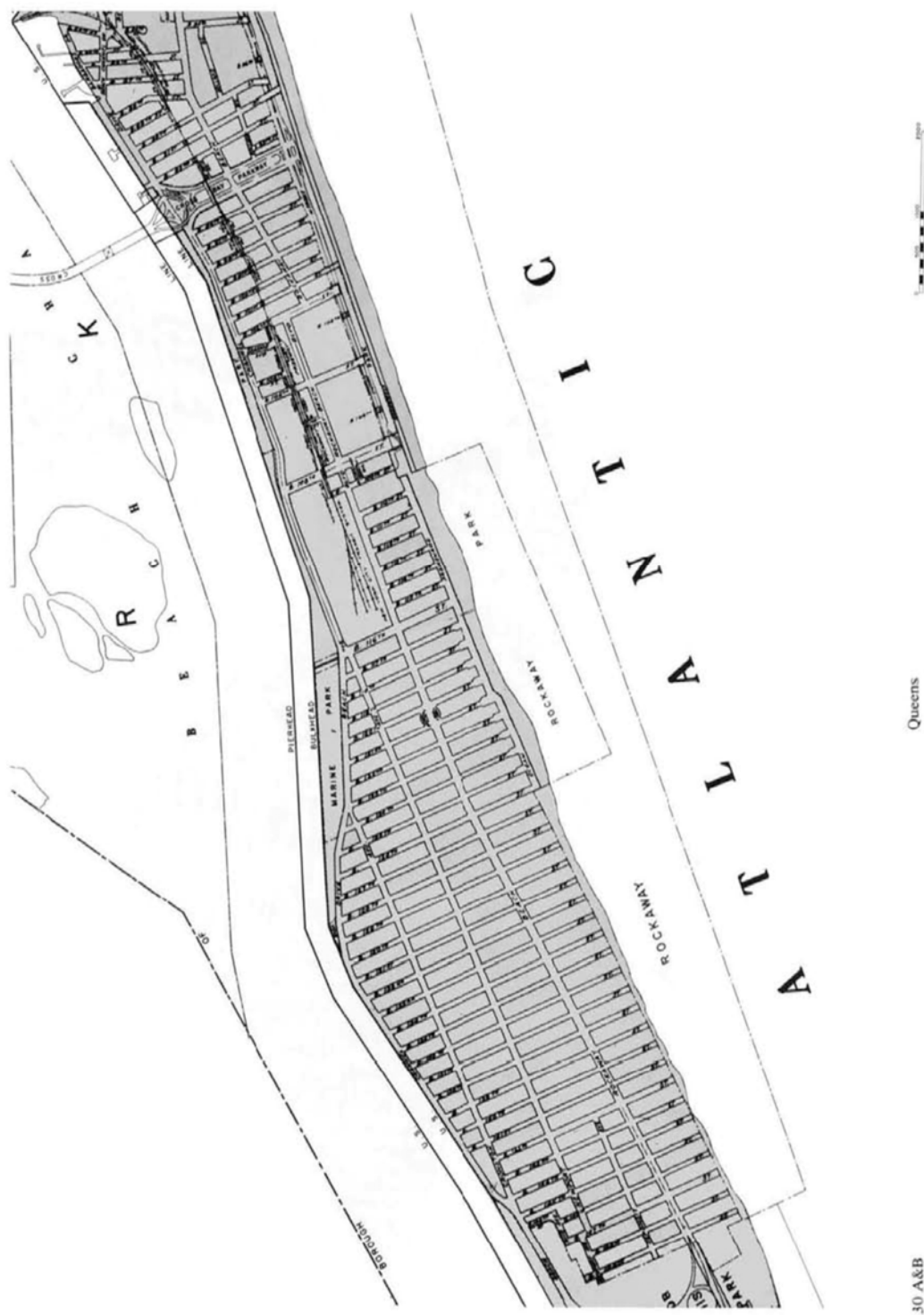
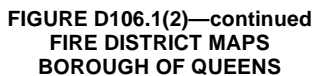
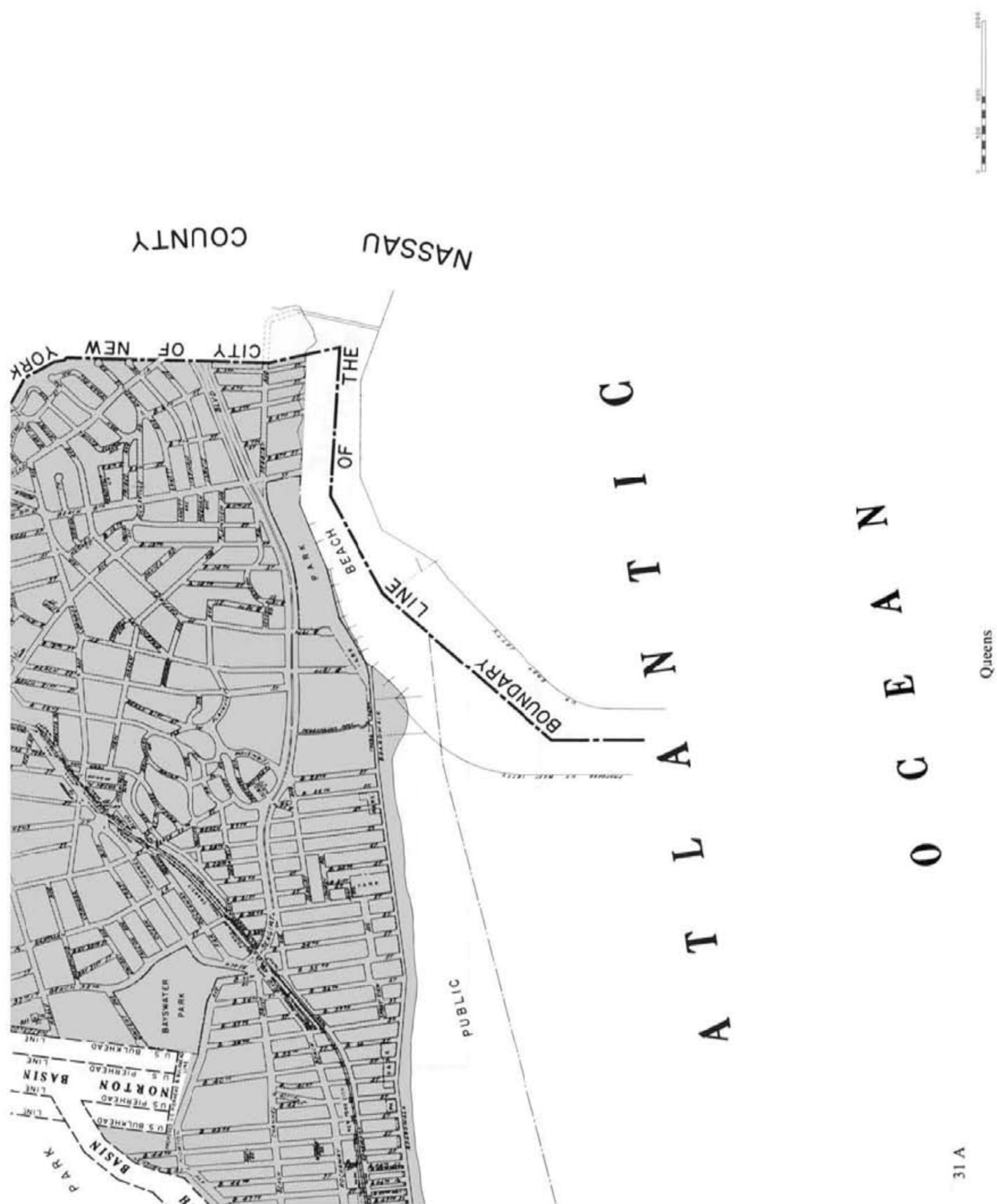


FIGURE D106.1(2)—continued  
FIRE DISTRICT MAPS  
BOROUGH OF QUEENS



**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**





**FIGURE D106.1(2)—continued**  
**FIRE DISTRICT MAPS**  
**BOROUGH OF QUEENS**

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## APPENDIX E

# SUPPLEMENTARY ACCESSIBILITY REQUIREMENTS



### SECTION BC E101 GENERAL

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**E101.1 Scope.** The provisions of this appendix shall control the supplementary requirements for the design and construction of facilities for accessibility to persons with physical disabilities.

**E101.2 Design.** Technical requirements for items herein shall comply with this code and ICC A117.1.

### SECTION BC E102 DEFINITIONS

**E102.1 General.** The following words and terms shall, for the purposes of this appendix, have the meanings shown herein.

**CLOSED-CIRCUIT TELEPHONE.** A telephone with a dedicated line such as a house phone, courtesy phone or phone that must be used to gain entrance to a facility.

**MAILBOXES.** Receptacles for the receipt of documents, packages or other deliverable matter. Mailboxes include, but are not limited to, post office boxes and receptacles provided by commercial mail-receiving agencies, apartment houses and schools.

**TRANSIENT LODGING.** A building, facility or portion thereof, excluding inpatient medical care facilities and long-term care facilities, that contains one or more dwelling units or sleeping units. Examples of transient lodging include, but are not limited to, resorts, group homes, hotels, motels, dormitories, homeless shelters, halfway houses and social service lodging.

### SECTION BC E103 ACCESSIBLE ROUTE

**E103.1 Raised platforms.** In banquet rooms or spaces where a head table or speaker's lectern is located on a raised platform, an accessible route shall be provided to the platform.

### SECTION BC E104 SPECIAL OCCUPANCIES

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**E104.1 General.** Transient lodging facilities shall be provided with accessible features in accordance with Sections E104.2 and E104.3. Group I-3 occupancies shall be provided with accessible features in accordance with Sections E104.3 and E104.4.

**E104.2 Accessible beds.** In rooms or spaces having more than 25 beds, five percent of the beds shall have a clear floor space complying with Section 305 (Clear Floor Space) of ICC A117.1.

**E104.2.1 Sleeping areas.** A clear floor space complying with Section 305 (Clear Floor Space) of ICC A117.1 shall be provided on both sides of the accessible bed. The clear floor space shall be positioned for parallel approach to the side of the bed.

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**Exception:** This requirement shall not apply where a single clear floor space complying with Section 305 (Clear Floor Space) of ICC A117.1 positioned for parallel approach is provided between two beds.

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**E104.3 Communication features.** Communication features complying with Chapter 7 of ICC A117.1 shall be provided in accordance with Sections E104.3.1 through E104.3.4 of this code.

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**E104.3.1 Transient lodging.** In transient lodging facilities, sleeping units with accessible communication features shall be provided in accordance with Table E104.3.1. Units required to comply with Table E104.3.1 shall be dispersed among the various classes of units.

**TABLE E104.3.1  
DWELLING OR SLEEPING UNITS WITH  
ACCESSIBLE COMMUNICATION FEATURES**

TOTAL NUMBER OF DWELLING OR SLEEPING UNITS PROVIDED	MINIMUM REQUIRED NUMBER OF DWELLING OR SLEEPING UNITS
1	1
2 to 25	2
26 to 50	4
51 to 75	7
76 to 100	9
101 to 150	12
151 to 200	14
201 to 300	17
301 to 400	20
401 to 500	22
501 to 1,000	5% of total
1,001 and over	50 plus 3 for each 100 over 1,000

**E104.3.2 Group I-3.** In Group I-3 occupancies at least 2 percent, but no fewer than one of the total number of general holding cells and general housing cells equipped with audible emergency alarm systems and permanently installed telephones within the cell, shall comply with Section E104.3.4.

**E104.3.3 Dwelling units and sleeping units.** Where dwelling units and sleeping units are altered or added, the requirements of Section E104.3 shall apply only to the units being altered or added until the number of units with

accessible communication features complies with the minimum number required for new construction.

**E104.3.4 Notification devices.** Visual notification devices shall be provided to alert room occupants of incoming telephone calls and a door knock or bell. Notification devices shall not be connected to visual alarm signal appliances. Permanently installed telephones shall have volume controls and an electrical outlet complying with ICC A117.1, including Section 309 (Operable Parts), located within 48 inches (1219 mm) of the telephone to facilitate the use of a TTY.

**E104.4 Partitions.** Solid partitions or security glazing that separates visitors from detainees in Group I-3 occupancies shall provide a method to facilitate voice communication. Such methods are permitted to include, but are not limited to, grilles, slats, talk-through baffles, intercoms or telephone handset devices. The method of communication shall be accessible to individuals who use wheelchairs and individuals who have difficulty bending or stooping. Hand-operable communication devices, if provided, shall comply with Section E106.3.

## SECTION BC E105 OTHER FEATURES AND FACILITIES

**E105.1 Portable toilets and bathing rooms.** Where multiple single-user portable toilet or bathing units are clustered at a single location, at least 5 percent, but not less than one toilet unit or bathing unit at each cluster, shall comply with ICC A117.1, including Section 603 (Toilet and Bathing Rooms). Signs containing the International Symbol of Accessibility and complying with Section 703 (Signs) of ICC A117.1 shall identify accessible portable toilets and bathing units.

**Exception:** Portable toilet units provided for use exclusively by construction personnel on a construction site.

**E105.2 Laundry equipment.** Where provided in spaces required to be accessible, washing machines and clothes dryers shall comply with this section. Where laundry equipment is provided within a dwelling or sleeping unit, not for public use or common use, such equipment shall comply with Section 1107.2.8.

**E105.2.1 Washing machines.** Where three or fewer washing machines are provided, at least one shall comply with ICC A117.1, including Section 611 (Washing Machines and Clothes Dryers), and shall be front loading. Where more than three washing machines are provided, at least two shall comply with ICC A117.1, including Section 611 and shall be front loading.

**E105.2.2 Clothes dryers.** Where three or fewer clothes dryers are provided, at least one shall comply with ICC A117.1, including Section 611 (Washing Machines and Clothes Dryers), and shall be front loading. Where more than three clothes dryers are provided, at least two shall comply with ICC A117.1, including Section 611, and shall be front loading.

**E105.3 Depositories, vending machines, change machines and similar equipment.** Where provided, at least one of each type of depository, vending machine, change machine and similar equipment shall comply with ICC A117.1.

**Exception:** Drive-up-only depositories are not required to comply with this section.

**E105.4 Mailboxes.** Where mailboxes are provided in facilities not subject to Section 1107.3.1, but required to be accessible pursuant to the *Americans with Disabilities Act*, at least five percent, but not less than one, of each type shall comply with ICC A117.1.

**E105.5 Automatic teller machines and fare machines.** Where automatic teller machines or self-service fare vending, collection or adjustment machines are provided, at least one machine of each type at each location where such machines are provided shall comply with ICC A117.1, including Section 707 (ATMs and Fare Machines). Where bins are provided for envelopes, wastepaper or other purposes, at least one of each type shall comply with ICC A117.1, including Section 905 (Storage Facilities).

**E105.6 Two-way communication systems.** Where two-way Communication systems are provided to gain admittance to a building or facility or to restricted areas within a building or facility, the system shall comply with ICC A117.1, including Section 708 (Two-Way Communication Systems).

## SECTION BC E106 TELEPHONES

**E106.1 General.** Where coin-operated public pay telephones, coinless public pay telephones, public closed-circuit telephones, courtesy phones or other types of public telephones are provided, accessible public telephones shall be provided in accordance with Sections E106.2 through E106.5 for each type of public telephone provided. For purposes of this section, a bank of telephones shall be considered two or more adjacent telephones.

**E106.2 Wheelchair-accessible telephones.** Where public telephones are provided, wheelchair-accessible telephones complying with ICC A117.1, including Section 704 (Telephones), shall be provided in accordance with Table E106.2.

**Exception:** Drive-up-only public telephones are not required to be accessible.

**E106.3 Volume controls.** All public telephones provided shall have volume control complying with Section 704.3 (Volume-Control Telephones) of ICC A117.1.

**E106.4 TTYs.** TTYs complying with ICC A117.1, including Sections 704.4 through 704.7, shall be provided in accordance with Sections E106.4.1 through E106.4.9.

**E106.4.1 Bank requirement.** Where four or more public pay telephones are provided at a bank of telephones, at least one public TTY shall be provided at that bank.

**Exception:** TTYs are not required at banks of telephones located within 200 feet (60 960 mm) of, and on the same floor as, a bank containing a public TTY.

**TABLE E106.2**  
**WHEELCHAIR-ACCESSIBLE TELEPHONES**

NUMBER OF TELEPHONES PROVIDED ON A FLOOR, LEVEL OR EXTERIOR SITE	MINIMUM REQUIRED NUMBER OF WHEELCHAIR-ACCESSIBLE TELEPHONES
1 or more single unit	1 per floor, level and exterior site
1 bank	1 per floor, level and exterior site
2 or more banks	1 per bank

**E106.4.2 Floor requirement.** Where four or more public pay telephones are provided on a floor of a privately owned building, at least one public TTY shall be provided on that floor. Where at least one public pay telephone is provided on a floor of a publicly owned building, at least one public TTY shall be provided on that floor.

**E106.4.3 Building requirement.** Where four or more public pay telephones are provided in a privately owned building, at least one public TTY shall be provided in the building. Where at least one public pay telephone is provided in a publicly owned building, at least one public TTY shall be provided in the building.

**E106.4.4 Site requirement.** Where four or more public pay telephones are provided on a site, at least one public TTY shall be provided on the site.

**E106.4.5 Rest stops, emergency road stops, and service plazas.** Where a public pay telephone is provided at a public rest stop, emergency road stop or service plaza, at least one public TTY shall be provided.

**E106.4.6 Hospitals.** Where a public pay telephone is provided in or adjacent to a hospital emergency room, hospital recovery room or hospital waiting room, at least one public TTY shall be provided at each such location.

**E106.4.7 Transportation facilities.** Transportation facilities shall be provided with TTYs in accordance with Section E109.2.5 in addition to the TTYs required by Sections E106.4.1 through E106.4.4.

**E106.4.8 Detention and correctional facilities.** In detention and correctional facilities, where a public pay telephone is provided in a secured area used only by detainees or inmates and security personnel, then at least one TTY shall be provided in at least one secured area.

**E106.4.9 Signs.** Public TTYs shall be identified by the International Symbol of TTY complying with Section 703.6.3.2 (International Symbol of TTY) of ICC A117.1. Directional signs indicating the location of the nearest public TTY shall be provided at banks of public pay telephones not containing a public TTY. Additionally, where signs provide direction to public pay telephones, they shall also provide direction to public TTYs. Such signs shall comply with ICC A117.1, including Section 703.2 (Visual Characters), and shall include the International Symbol of TTY.

**E106.5 Shelves for portable TTYs.** Where a bank of telephones in the interior of a building consists of three or more public pay telephones, at least one public pay telephone at the bank shall be provided with a shelf and an electrical out-

let in accordance with Section 704.6 (TTY Shelf) of ICC A117.1. **NYC**

**Exceptions:**

1. In secured areas of detention and correctional facilities, if shelves and outlets are prohibited for purposes of security or safety shelves and outlets for TTYs are not required to be provided.
2. The shelf and electrical outlet shall not be required at a bank of telephones with a TTY.

**SECTION BC E107**  
**SIGNAGE**

**E107.1 Signs.** Required accessible portable toilets and bathing facilities shall be identified by the International Symbol of Accessibility.

**E107.2 Designations.** Interior and exterior signs identifying permanent rooms and spaces shall be tactile. Where pictograms are provided as designations of interior rooms and spaces, the pictograms shall have tactile text descriptors. Signs required to provide tactile characters and pictograms shall comply with Sections 703.3 and 703.5 of ICC A117.1. **NYC**

**Exceptions:**

1. Exterior signs that are not located at the door to the space they serve are not required to comply.
2. Building directories, menus, seat and row designations in assembly areas, occupant names, building addresses and company names and logos are not required to comply.
3. Signs in parking facilities are not required to comply.
4. Temporary (seven days or less) signs are not required to comply.
5. In detention and correctional facilities, signs not located in public areas are not required to comply.

**E107.3 Directional and informational signs.** Signs that provide direction to, or information about, permanent interior spaces of the site and facilities shall contain visual characters complying with Section 703.2 (Visual Characters) of ICC A117.1. **NYC**

**Exception:** Building directories, personnel names, company or occupant names and logos, menus and temporary (seven days or less) signs are not required to comply with ICC A117.1.



**E107.4 Other signs.** Signage indicating special accessibility provisions shall be provided at fixed facilities and stations, signage must be provided in accordance with Sections E109.2.2 through E109.2.2.3.

## SECTION BC E108 RESERVED

## SECTION BC E109 TRANSPORTATION FACILITIES AND STATIONS

**E109.1 General.** Fixed transportation facilities and stations shall comply with the applicable provisions of Section E109.2.

**E109.2 New construction.** New stations in rapid rail, light rail, commuter rail, intercity rail, high speed rail and other fixed guideway systems shall comply with Sections E109.2.1 through E109.2.8.

**E109.2.1 Station entrances.** Where different entrances to a station serve different transportation fixed routes or groups of fixed routes, all entrances serving each group or route shall comply with Section 1104 and ICC A117.1, including Section 404 (Doors and Doorways).

**E109.2.2 Signs.** Signage in fixed transportation facilities and stations shall comply with Sections E109.2.2.1 through E109.2.2.3.

**E109.2.2.1 Tactile signs.** Where signs are provided at entrances to stations identifying the station or the entrance, or both, at least one sign at each entrance shall be tactile. A minimum of one tactile sign identifying the specific station shall be provided on each platform or boarding area. Such signs shall be placed in uniform locations at entrances and on platforms or boarding areas within the transit system to the maximum extent practicable. Tactile signs shall comply with Section 703.3 (Tactile Characters) of ICC A117.1.

### Exceptions:

1. Where the station has no defined entrance but signs are provided, the tactile signs shall be placed in a central location.
2. Signs are not required to be tactile where audible signs are remotely transmitted to hand-held receivers, or are user or proximity actuated.

**E109.2.2.2 Identification signs.** Stations covered by this section shall have identification signs containing visual characters complying with Section 703.2 (Visual Characters) of ICC A117.1. Signs shall be clearly visible and within the sightlines of a standing or sitting passenger from within the train on both sides when not obstructed by another train.

**E109.2.2.3 Informational signs.** Lists of stations, routes and destinations served by the station which are located on boarding areas, platforms or mezzanines shall provide visual characters complying with Section

703.2 (Visual Characters) of ICC A117.1. Signs covered by this provision shall, to the maximum extent practicable, be placed in uniform locations within the transit system.

**E109.2.3 Fare machines.** Self-service fare vending, collection and adjustment machines shall comply with Section 707 (ATMs and Fare Machines) of ICC A117.1. Where self-service fare vending, collection or adjustment machines are provided for the use of the general public, at least one accessible machine of each type provided shall be provided at each accessible point of entry and exit.

**E109.2.4 Rail-to-platform height.** Station platforms shall be positioned to coordinate with vehicles in accordance with the applicable provisions of 36 CFR, Part 1192. Low-level platforms shall be 8 inches (203 mm) minimum above top of rail.

**Exception:** Where vehicles are boarded from sidewalks or street level, low-level platforms shall be permitted to be less than 8 inches (203 mm).

**E109.2.5 TTYs.** Where a public pay telephone is provided in a transit facility (as defined by the Department of Transportation) at least one public TTY complying with Sections 704.4 through 704.7 of ICC A117.1 shall be provided in the station. In addition, where one or more public pay telephones serve a particular entrance to a transportation facility, at least one TTY telephone complying with Section 704.4 through 704.7 of ICC A117.1 shall be provided to serve that entrance.

**E109.2.6 Track crossings.** Where a circulation path serving boarding platforms crosses tracks, an accessible route complying with ICC A117.1, including Section 402 (Accessible Routes) shall be provided.

**Exception:** Openings for wheel flanges shall be permitted to be 2<sup>1</sup>/<sub>2</sub> inches (64 mm) maximum.

**E109.2.7 Public address systems.** Where public address systems convey audible information to the public, the same or equivalent information shall be provided in a visual format.

**E109.2.8 Clocks.** Where clocks are provided for use by the general public, the clock face shall be uncluttered so that its elements are clearly visible. Hands, numerals and digits shall contrast with the background either light-on-dark or dark-on-light. Where clocks are mounted overhead, numerals and digits shall comply with Section 703.2 (Visual Characters) of ICC A117.1.

## E109.3 Reserved.

## SECTION BC E110 RESERVED

## SECTION BC E111 RESERVED

## SECTION BC E112 REFERENCED STANDARDS

**E112.1 General.** This section lists the standards that are referenced in various sections of this appendix. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard.

**E112.2 Subsequent additions, modifications, or deletions.** Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to these standards in accordance with Section 28-103.19 of the *Administrative Code*.

**E112.3 Applicability.** The application of the referenced standards shall be as specified in Section 102.4.

### **E112.4 Standards.**

DOJ 36 CFR Part 1192	<i>Americans with Disabilities Act (ADA) Accessibility Guidelines for Transportation Vehicles (ADAAG). Washington, DC: Department of Justice, 1991</i>	E109.2.4
ICC A117.1—09	Accessible and Usable Buildings and Facilities	E101.2, et al.



## APPENDIX F

# RODENTPROOFING

### SECTION BC F101 GENERAL

**F101.1 Scope.** The provisions of this appendix provide rodent-proofing design and construction requirements for the resistance of rodent ingress and infestation. For rodent extermination provisions related to demolition operations, see Section 3306. The *New York City Health Code*, the *New York City Housing Maintenance Code*, and the *New York City Sanitation Code* may contain additional provisions, as enforced by the New York City Department of Health and Mental Hygiene, the New York City Department of Housing Preservation and Development, and the New York City Sanitation Department.

**F101.2 General.** Every structure, room, or space hereafter altered or erected in which persons live, sleep or work, or in which feed, food or foodstuffs are stored, prepared, processed, served or sold, shall be constructed in accordance with the provisions of this section. All metal or wire protection materials specified herein shall be noncorrosive.

**F101.3 Reserved.**

**F101.4 Reserved.**

**F101.5 Reserved.**

**F101.6 Reserved.**

### SECTION BC F102 PROTECTION

**F102.1 Exterior walls and underground walls.** For walls or portions thereof within 2 feet (610 mm) of the outside ground level, and for walls below the outside ground level, all openings, including but not limited to, annular spaces around pipes, electric cables, and conduits, shall be protected by closing such openings with cement mortar, concrete masonry, metal plates or screening designed to prevent the passage of rodents. Openings for doors, windows and vents shall be as provided for in Sections F102.3, F102.4 and F102.5, respectively.

**F102.2 Floors on grade.** Unless otherwise specified in this code, floors on grade, including but not limited to cellar floors and crawl space floors, shall be constructed of a minimum 2 inches (51 mm) thick continuous concrete slab. Gaps shall not be permitted between the slab and the abutting foundation walls or columns, except where expansion joints, thermal breaks, and control joints are located. All openings, including but not limited to, annular spaces around pipes, electric cables, and conduits in the slab shall be protected by closing such openings with cement mortar, concrete masonry, metal plates or screening designed to prevent the passage of rodents.

**F102.3 Exterior doors.** Where an exterior door is nonmetal or nonmetal-clad, such door shall be covered with a kick plate of a minimum thickness of 0.033 inch (0.84 mm), extending at least 8 inches (203 mm) from the bottom of the door, and covering the entire width of the door. When closed, the maximum clearance between any door, door jambs and sills shall not be greater than  $\frac{3}{8}$  inch (9.5 mm).

**F102.4 Windows and other openings.** Windows and other openings shall comply with Sections F102.4.1 and F102.4.2.

**F102.4.1 Openings within 2 feet of ground level.** Operable windows and other openings providing required or voluntary natural ventilation located with any portion within 2 feet (610 mm) above outside ground level immediately below such opening shall be covered for their entire height and width of the operable portion with hardware cloth of at least 0.035 inch (0.89 mm) wire or heavier. The openings in the hardware cloth shall not exceed  $\frac{1}{4}$  inch (6.4 mm).

**F102.4.2 Rodent-accessible openings.** Operable windows and other openings providing required or voluntary natural ventilation in the exterior located within 2 feet (610 mm) of exposed pipes, wires, conduits and other appurtenances, shall be covered with wire cloth of at least 0.035 inch (0.89 mm) wire. The openings in the hardware cloth shall not exceed  $\frac{1}{4}$  inch (6.4 mm).

**Exception:** In lieu of wire cloth covering, said pipes, wires, conduits and other appurtenances shall be blocked from rodent usage in accordance with one of the following:

1. Installation of solid sheet metal collars 0.024 inch (0.61 mm) thick or heavier. Such collars shall be fastened around the pipes, wires, conduits or other appurtenances, projecting a minimum distance of 12 inches (305 mm) beyond and on either side of the pipes, wires, conduits or appurtenances.
2. Installation of solid sheet metal guards fastened securely to the exterior wall, projecting 12 inches (305 mm) perpendicularly from the exterior wall for the length of the opening plus 2 feet (610 mm) beyond each end of the opening.

**F102.5 Exterior wall ventilation openings.** Exterior wall ventilator openings located with any portion within 2 feet (610 mm) of outside ground level shall be covered for their height and width with perforated sheet metal plates no less than 0.070 inch (1.8 mm) thick, expanded sheet metal plates not less than 0.047 inch (1.2 mm) thick, cast iron grills or grating, extruded aluminum load-bearing vents or with hardware cloth of 0.035 inch (0.89 mm) wire or heavier. The openings therein shall not exceed  $\frac{1}{4}$  inch (6.4 mm).







**G102.1 General.** This appendix, in conjunction with the *New York City Construction Codes*, provides minimum requirements for development located, in whole or in part, in areas of special flood hazard and shaded X-Zones within the jurisdiction of New York City, including:

10. **Other alterations to pre-FIRM construction.** This appendix shall apply to alterations or repairs to pre-FIRM buildings and structures, including installation of new components, materials, finishes and equipment, that increase the degree of noncompliance with this appendix. The following alterations or repairs,

This appendix, in conjunction with the *Construction Codes*, provides minimum development located, in whole or in part, in flood hazard and shaded X-Zones within the City of New York City, including:

10. **Other alterations to pre-FIRM construction.** This appendix shall apply to alterations or repairs to pre-FIRM buildings and structures, including installation of new components, materials, finishes and equipment, that increase the degree of noncompliance with this appendix. The following alterations or repairs,

**G101.4 Reserved.**

other than substantial improvements, shall not be deemed as an increase in the degree of noncompliance:

- 10.1. Where the alteration or repair comprises the replacement of pre-FIRM components, materials, finishes or equipment;
- 10.2. Where the alteration or repair comprises the installation of new components, materials, finishes or equipment in a space within the structure where similar pre-FIRM components, materials, finishes or equipment already exist; and
- 10.3. Where such alteration is a change in use, occupancy or how such space is used, provided that such change would not increase the degree of noncompliance with requirements of this appendix. The conversion of any space below the design flood elevation from nonhabitable space into habitable space shall be deemed an increase in the degree of noncompliance.

11. **Retroactive requirements.** This appendix shall apply to retroactive requirements as provided for in Section G311.

#### **G102.2 Establishment of areas of special flood hazard.**

The following flood hazard map and supporting data are adopted as referenced standards and declared to be a part of this appendix:

1. FEMA FIS 360497.
2. FEMA FIRMs 360497.

**G102.2.1 Preliminary flood insurance study and rate maps.** Until such time that the department by rule adopts revised FEMA FIS 360497 and FEMA FIRMs 360497 with a final effective date later than May 1, 2014, the following flood hazard maps and supporting data are also adopted as a referenced standard and declared a part of this appendix.

1. FEMA PFIS 360497.
2. FEMA PFRIMs 360497.

**G102.2.2 Effect of preliminary flood insurance study and rate maps.** Notwithstanding any other provision in this appendix to the contrary:

1. All references in this appendix to elevations in FEMA FIS 360497 and FEMA FIRMs 360497 shall be deemed to refer to the greater of (i) the elevations identified in the FEMA FIS 360497/FEMA FIRMs 360497 or (ii) the elevations identified in the FEMA PFIS 360497/FEMA PFIRMs 360497. In comparing elevations, the elevations identified in FEMA FIS 360497 and FEMA FIRMs 360497 that are expressed in relation to the National Geodetic Vertical Datum (NGVD) shall be converted to the North American Vertical Datum (NAVD).
2. All references in this appendix to areas of special flood hazard as delineated on FEMA FIRMs 360497

shall be deemed to refer to the area of special flood hazard as delineated on FEMA PFIRMs 360497 except that, where a structure is located in an area of special flood hazard as delineated on FEMA PFIRMs 360497 and in a more restrictive area of special flood hazard as delineated on FEMA FIRMs 360497, such structure shall be deemed to be located in the more restrictive area of special flood hazard as delineated on FEMA FIRMs 360497.

**G102.3 Letters of map change.** Map changes to FEMA FIRMs 360497 shall be administered in compliance with Sections G102.3.1 through G102.3.3.

**G102.3.1 Letters of map amendment (LOMA).** Where FEMA FIRMs 360497 indicates that a structure or tax lot is within a delineated area of special flood hazard, but the pre-FIRM ground elevations adjacent to the structure or throughout the tax lot are at or above the base flood elevation, the commissioner shall deem such structure or tax lot as being within the area of special flood hazard and shall not approve plans except in compliance with this appendix, unless a letter of map amendment (LOMA) is issued by FEMA removing such structure or tax lot from the area of special flood hazard.

**G102.3.1.1 Letters of map amendment (LOMAs) during pendency of PFIRMs.** Until such time that the department by rule adopts revised FEMA FIS 360497 and FEMA FIRMs 360497 with a final effective date later than May 1, 2014, the commissioner shall not deem issuance of a LOMA by FEMA as removing such structure or tax lot from the area of special flood hazard unless the elevations specified in the LOMA equal or exceed the applicable corresponding elevations on the FEMA PFIS 360497/FEMA PFIRMs 360497.

**G102.3.2 Letter of map revision based on fill (LOMR-F).** Where FEMA FIRMs 360497 indicates that a structure or tax lot is within a delineated area of special flood hazard, but post-FIRM compacted fill is proposed to be added adjacent to the structure or throughout the tax lot to an elevation at or above the base flood elevation, the commissioner shall deem such structure or tax lot as being within the area of special flood hazard and shall not approve plans except in compliance with this appendix, unless a conditional or final letter of map revision based on fill (LOMR-F) is issued by FEMA removing such structure or tax lot from the area of special flood hazard. Buildings constructed with basements below the Base Flood Elevation on filled land shall maintain a minimum setback distance of 20 feet (6096 mm)±, at or above the Base Flood Elevation, from the edge of the Special Flood Hazard Area to the nearest wall of the basement, regardless of the design approach used. The commissioner shall promulgate rules establishing procedures for processing letters of map revision based on fill (LOMR-F).

**G102.3.2.1 Letters of map revision based on fill (LOMR-Fs) during pendency of PFIRMs.** Until such time that the department by rule adopts revised FEMA FIS 360497 and FEMA FIRMs 360497 with a final

effective date later than May 1, 2014, the commissioner shall not deem issuance of a LOMR-F as removing such structure or tax lot from the area of special flood hazard unless the elevations specified in the LOMR-F equal or exceed the applicable corresponding elevations on the FEMA PFIS 360497/FEMA PFIRMs 360497.

**G102.3.3 Certificates of occupancy.** Certificates of occupancy shall indicate that the structure or tax lot is subject to a letter of map amendment (LOMA) or letter of map revision based on fill (LOMR-F) as per Section G106.5.

## SECTION BC G103 ADMINISTRATION

**G103.1 Permit applications.** The commissioner is hereby designated as the flood plain administrator for the City of New York and shall review permit applications to determine that:

1. Proposed development sites will be reasonably safe from flooding;
2. All site development activities, including grading, filling, utility installation and drainage modification, and all new construction and substantial improvements (including the placement of prefabricated buildings and manufactured homes) are designed and constructed with methods, practices and materials that minimize flood damage and that are in accordance with this code and ASCE 24; and
3. All other required state and federal permits have been obtained.

**G103.2 Reserved.**

**G103.3 Determination of base flood elevations.** Where the proposed development is within an area of special flood hazard but the base flood elevations are not specified in the FEMA FIRMs 360497, the commissioner shall require the applicant to request base flood elevation data from the New York State Department of Environmental Conservation (DEC); and

1. Submit to the commissioner either:
  - 1.1. A letter from DEC making such a determination of base flood elevation; or
  - 1.2. A letter from the DEC indicating that the data are not available. When such a letter from DEC indicates that the data are not available, the base flood elevation shall be equal to 3 feet (914 mm) above the highest adjacent pre-FIRM grade.

**Exception:** Large lots. Where the base flood elevation is not specified, the applicant shall submit a detailed engineering study establishing the base flood elevation, performed by an engineer in accordance with accepted hydrologic and hydraulic engineering techniques, in sufficient detail to allow review by the commissioner for any of the following conditions:

1. For a development which is located on a tax lot greater than 5 acres (2.02 hectares), or is located on property that was part of a tax lot that was greater than 5 acres (2.02 hectares) at the time of the adoption of the FIRM (October 1, 1984), or at any subsequent applicable map change thereto; or
2. For subdivisions resulting in 50 or more tax lots, including all tax lots previously subdivided from the same tax lot since the adoption of the FIRM (October 1, 1984), or since any subsequent applicable map changes thereto.

### **G103.3.1 Determination of 500-year flood elevations.**

Where 500-year flood elevations are not specified in the FEMA FIRMs 360497 or FEMA FIS 360497, such elevations shall be determined by a registered design professional using modeling based on generally accepted engineering methods or a review of available data from city, state and federal agencies.

### **G103.4 Reserved.**

**G103.5 Floodway encroachment.** Prior to issuing a permit for any floodway encroachment, including fill, new construction, substantial improvements and other development or land-disturbing activity, the commissioner shall require submission of a certification, along with supporting technical data, demonstrating that such development will not cause any increase of the level of the base flood. However, a floodway encroachment that increases the level of the base flood may be authorized if the applicant has:

1. Applied for a conditional Letter of Map Revision; and
2. Received the approval of the Federal Emergency Management Agency (FEMA).

**G103.6 Watercourse alteration.** Prior to issuing a permit for any alteration or relocation of any watercourse within an area of special flood hazard, the commissioner shall require the applicant to:

1. Notify any affected adjacent municipalities or government jurisdictions;
2. Notify the DEC;
3. Submit evidence of such notifications to the commissioner and the Regional Director, Region II, the Federal Emergency Management Agency (FEMA);
4. Submit to the commissioner evidence of all such notifications;
5. Submit an engineering analysis demonstrating that the flood-carrying capacity of the altered or relocated portion of the watercourse will not be decreased; and
6. Submit evidence that such watercourses will be maintained in a manner which preserves the channel's flood-carrying capacity.

**G103.7 Sand dune alterations in V-Zones.** Prior to issuing a permit for any alteration of sand dunes in a V-Zone, the commissioner shall require submission of an engineering analysis demonstrating that the proposed alteration will not increase the potential for flood damage.



**G103.8 Records.** The commissioner shall maintain records of the following:

1. Applications and supporting documents for development in areas of special flood hazard;
2. Permits issued in areas of special flood hazard;
3. Inspection reports;
4. Certifications required in this appendix; and
5. Certificate of occupancy where applicable.

**G103.9 Violations.** See Chapter 2 of Title 28 of the *Administrative Code*.

## SECTION BC G104 PERMITS

**G104.1 Permit required.** Any person, owner or authorized agent who intends to conduct any development, as applicable pursuant to Section G102.1, within an area of special flood hazard, shall first apply to the commissioner and shall obtain the required permit in accordance with Section 28-105.1 of the *Administrative Code*, notwithstanding any exemption pursuant to Section 28-105.4 of the *Administrative Code*.

**G104.2 Permit application requirements.** The applicant shall file an application in writing on a form furnished by the commissioner. The commissioner shall not approve such application unless the applicant submits all plans, details, data and documents demonstrating that the development complies with Section G104 and all other provisions of this appendix.

**G104.3 Site plan.** The permit application shall include a site plan. The site plan shall include plans and drawings, shall be sealed by a registered design professional and shall include the following information and any other data as may be required by the department:

1. A delineation of the flood hazard areas, including identification of the base and design flood and elevations;
2. If applicable, the location of the regulatory floodway;
3. For all proposed structures, spot ground elevations at building corners and in 20-foot (6096 mm) or smaller intervals along the foundation footprint, or 1-foot (305 mm) contour elevations throughout the building site;
4. Proposed locations of water supply, sanitary sewer, and utilities;
5. Drainage patterns and facilities; and
6. Foundation design details, including but not limited to:
  - 6.1. Proposed elevation of the lowest floor including basement (for flood zone purposes) of all structures;
  - 6.2. For crawl spaces and enclosed parking, storage and building access that are wet floodproofed below the design flood elevation, location and total net area of foundation openings in accordance with ASCE 24;

6.3. For dry floodproofed spaces in buildings or structures that are nonresidential (for flood zone purposes), the proposed elevation to which the enclosure will be dry floodproofed in accordance with ASCE 24; and

6.4. Any proposed fill and excavation details.

**Exception:** Applications for subdivisions shall comply with Section G302.

**G104.4 Water course alteration.** The permit application shall include, if applicable, a description of the extent to which any watercourse will be altered or relocated as a result of proposed development, and any documentation required by Section G103.6.

**G104.5 Certifications.** The permit application shall include the applicable certifications in accordance with Sections G104.5.1 through G104.5.3.

**G104.5.1 A-Zones.** For construction in A-Zones, the permit application shall include the following certifications, as applicable:

1. **Wet floodproofing certification.** For wet floodproofed enclosures below the design flood elevation, construction documents shall include a certification by the applicant that the design provides for the automatic entry and exit of floodwaters for equalization of hydrostatic flood forces in accordance with Section 2.6.2, ASCE 24.
2. **Dry floodproofing certification for nonresidential buildings.** For dry floodproofed buildings and structures that are nonresidential (for flood zone purposes), construction documents shall include a certification by the applicant that the dry floodproofing is designed in accordance with ASCE 24.
3. **Utility certifications.** For all applications involving utility or mechanical work, including applications where such work is to be filed in a separate, related application, construction documents shall include a certification by the applicant that "all heating, ventilation, air conditioning, plumbing, electrical and other services facilities and equipment within the structure or site will be located or constructed so as to prevent water from entering or accumulating within the components during conditions of flooding in accordance with ASCE 24."

**G104.5.2 V-Zones and coastal A-Zones.** For construction in V-Zones and coastal A-Zones the permit application shall include the following certifications, as applicable:

1. **Structural design certification.** Construction documents shall include a certification by the applicant that the "entire structure is designed in accordance with ASCE 24, including that the pile or column foundation and building or structure to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16 of the *New York City Building Code*."

2. **Breakaway wall certification.** Where breakaway walls are provided, construction documents shall include a certification by applicant that “the breakaway walls meet the load requirements of Section 5.3.3 of ASCE 7, are designed in accordance with ASCE 24, and are of an open lattice-type construction only.”

3. **Utility certifications.** For all applications involving utility or mechanical work, including applications where such work is to be filed in a separate, related application, construction documents shall include a certification by the applicant that “all heating, ventilation, air conditioning, plumbing, electrical and other services, facilities and equipment within the structure or site will be located or constructed so as to prevent water from entering or accumulating within the components during conditions of flooding, in accordance with ASCE 24.”

**G104.5.3 Floodway encroachment certification.** For any floodway encroachment, including fill, new construction, substantial improvements and other development or land-disturbing activity, the applicant shall submit a certification, along with supporting technical data, demonstrating that such development will not cause any increase of the level of the base flood in accordance with the requirements of Section G103.5.

**G104.6 Validity of permit.** The issuance of a permit under this appendix shall not be construed to be a permit for, or approval of, any violation of this appendix or any other provision of this code. The issuance of a permit based on submitted documents and information shall not prevent the commissioner from requiring the correction of errors. The commissioner is authorized to prevent occupancy or use of a structure or site which is in violation of this appendix or other provisions of this code.

**G104.7 Permit expiration.** A permit shall become invalid if the proposed development:

1. Is not commenced within 180 days after its issuance; or
2. If the work authorized is suspended or abandoned for a period of 180 days after the work commences.

**G104.8 Permit reinstatement.** Permit reinstatements for a permit that has expired pursuant to Section G104.7 shall be requested in writing. The commissioner is authorized to grant such reinstatement, provided that the work shall comply with all of the requirements of this appendix, including any revised FEMA FIRMs 360497 in effect at the time the application for reinstatement is made, and provided further that the applicant shall pay all reinstatement fees as required in Article 112 of Title 28 of the *New York City Administrative Code*.

**G104.9 Permit suspension or revocation.** The commissioner is authorized to suspend or revoke a permit issued under this appendix wherever the permit is issued in error or on the basis of incorrect, inaccurate or incomplete information, or in violation of this code, in accordance with Section 28-105.

## SECTION BC G105 PROGRESS AND SPECIAL INSPECTION REQUIREMENTS

**G105.1 General.** Progress and special inspections shall be performed in accordance with this section. All work applications, regardless of the scope of work, shall be subject to the progress and special inspection requirements of Sections G105.2 through G105.4.

**G105.2 All work applications other than new buildings and substantial improvements.** All work applications other than new buildings and substantial improvements, shall be subject to the following special inspection:

1. **Flood zone compliance special inspection.** Prior to sign-off of work, a special inspector or special inspection agency shall inspect during the course of construction and certify that: “the structure was constructed” or “alterations were performed,” “with methods and practices that minimize flood damage and that are in accordance with approved plans, and with any applicable provisions of Appendix G of the *New York City Building Code* and ASCE 24.”

**G105.3 New buildings and substantial improvements.** All applications for new buildings or substantial improvements shall be subject to the following inspections:

1. **Elevation progress inspection.** Upon placement of the lowest floor, including the basement (for flood zone purposes), an engineer or licensed professional surveyor shall inspect the site and verify the elevation of such lowest floor. The inspection report verifying the elevation shall be submitted to the department prior to further vertical construction. The commissioner shall be permitted to issue a stop work order if such inspection report is not submitted.
2. **Flood zone compliance special inspection.** Prior to sign-off of work, a special inspector or special inspection agency shall inspect during the course of construction and certify that: “the structure was constructed” or “alterations were performed,” “with methods and practices that minimize flood damage and that are in accordance with approved plans, and with any applicable provisions of Appendix G of the *New York City Building Code* and ASCE 24.”
3. **Final elevation required items.** Prior to the sign-off of the flood zone compliance special inspection, the special inspector or special inspection agency shall verify that the following required items have been submitted to the department, as applicable:
  - 3.1. **Elevation certificate.** The elevation certificate shall be made utilizing FEMA Form 086-0-33 titled, “Elevation Certificate,” and shall be signed by an engineer or surveyor.
  - 3.2. **Dry floodproofing certificate.** The Dry floodproofing certificate shall be made utilizing FEMA Form 086-0-34 titled, “Floodproofing Certificate,” and shall be signed by an engineer.

**G105.4 Flood shield inspection.** Where floodshields or other flood control devices are installed as part of a dry

NYC floodproofing system in buildings and structures that are  
 NYC nonresidential (for flood zone purposes), the special inspec-  
 NYC tor or special inspection agency responsible for the flood  
 NYC zone compliance special inspection shall inspect the shields  
 NYC or devices in their stored positions or locations, witness their  
 NYC activation or transportation to their installed positions, and  
 NYC witness their deactivation or transportation back to their  
 NYC stored locations. The special inspector or special inspection  
 NYC agency shall also confirm the installation of signage required  
 NYC by ASCE 24, Section 6.2.3, Item 3.

NYC **G105.5 Reserved.**

NYC **G105.6 Reserved.**

NYC **G105.7 Reserved.**

## SECTION BC G106 CERTIFICATES OF OCCUPANCY

**G106.1 Applicability.** This section shall apply to post-FIRM construction and substantial improvements where the work results in the issuance of a new or amended certificate of occupancy.

**G106.2 Enclosed areas subject to flooding in A-Zones.** The certificate of occupancy shall describe all wet floodproofed enclosed areas below the design flood elevation as “subject to flooding”. Such wet floodproofed enclosed areas shall be usable solely for parking, storage, building access or crawl spaces.

**G106.3 Enclosed areas subject to flooding in V-Zones and coastal A-Zones.** The certificate of occupancy shall describe all enclosed areas below the design flood elevation as “subject to flooding”. Such enclosed areas shall be usable solely for parking, storage and building access.

**G106.4 Dry floodproofed spaces.** The certificate of occupancy shall describe any dry floodproofed spaces as “dry floodproofed.” For such buildings containing dwelling units, patient care areas (for flood zone purposes) or spaces intended to be used by persons for sleeping purposes, the certificate of occupancy shall also provide notations as required by Section G304.1.2, Item 2.2.5. Where flood shields or other flood control devices are installed, the certificate of occupancy shall also provide notations describing these features.

**G106.5 Letters of map change.** Where applicable, the certificate of occupancy shall indicate that “the structure is exempted from the area of special flood hazard pursuant to FEMA Letter of Map Amendment (LOMA) # (\_\_\_\_),” or that “the structure is exempted from the area of special flood hazard pursuant to FEMA Letter of Map Revision Based on Fill (LOMR-F) # (\_\_\_\_),” or that “the structure is exempted from the area of special flood hazard pursuant to FEMA Letter of Map Revision (LOMR) # (\_\_\_\_).”

## SECTION BC G107 VARIANCES

NYC **G107.1 General.** The Board of Standards and Appeals shall  
 NYC hear and decide requests for variances from the requirements

of this appendix. The Board of Standards and Appeals shall base its determination on technical justifications, and has the right to attach such conditions to variances as it deems necessary to further the purposes and objectives of this appendix.

### G107.2 Conditions for variance.

**G107.2.1 Historic structures.** The Board of Standards and Appeals is authorized to issue a variance for the repair or rehabilitation of a historic structure provided that:

1. The application has received approval from the Landmark Preservation Commission and/or the New York State Historical Preservation Office, as applicable;
2. The proposed repair or rehabilitation will not preclude the structure's continued designation as a historic structure; and
3. The variance is the minimum necessary to preserve the historic character and design of the structure.

**G107.2.2 Floodway restrictions.** The Board of Standards and Appeals shall not issue a variance for any proposed development in a floodway if any increase in flood levels would result during the base flood discharge.

**G107.2.3 General conditions for variance.** Except for historic structures as provided for in Section G107.2.1, the Board of Standards and Appeals is authorized to issue a variance only upon:

1. A determination that the new construction, substantial improvement, or other proposed development is located on a tax lot that, on November 16, 1983, was no more than  $\frac{1}{2}$  acre (0.2 hectare) in size. However, where the tax lot has been determined to be larger than  $\frac{1}{2}$  acre (0.2 hectare), the technical justification required for issuing the variance increases with the lot size;
2. Showing of good and sufficient cause;
3. Determination that failure to grant the variance would result in exceptional hardship to the applicant;
4. Determination that the granting of a variance will not result in:
  - a. Increased flood heights;
  - b. Additional threats to public safety;
  - c. Extraordinary public expense;
  - d. Nuisances;
  - e. Fraud on or victimization of the public; or
  - f. Conflict with existing local laws or ordinances; and
5. Determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

**G107.2.4 Functionally dependent facilities.** The Board of Standards and Appeals is authorized to issue a variance



NYC for the construction or substantial improvement of a functionally dependent facility provided that:

1. The criteria for Sections G107.2.1 through G107.2.3 are met; and
2. All methods and materials utilized minimize flood damage during the base flood and create no additional threats to public safety.

NYC **G107.3 Standards for variance.** In reviewing applications for variances, the Board of Standards and Appeals shall consider all technical evaluations, all relevant factors, all other portions of this appendix and the following:

1. The danger that materials and debris may be swept onto other lands resulting in injury or damage;
2. The danger to life and property due to flooding or erosion damage;
3. The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners;
4. The importance of the services provided by the proposed development to the community;
5. The availability of alternate locations for the proposed development that are not subject to flooding or erosion;
- ⇒ 6. The relationship of the proposed development to the comprehensive plan and flood plain management program for that area;
7. The safety of access to the property in times of flood for ordinary and emergency vehicles;
8. The expected heights, velocity, duration, rate of rise and debris and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and
9. The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, streets and bridges.

NYC **G107.4 Notification of risks.** Upon issuance of a variance, the Executive Director of the Boards of Standards and Appeals shall provide written notice to the owner and the applicant that:

1. The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as twenty-five dollars for each one hundred dollars of insurance coverage; and
2. That such construction below the base flood level increases risks to life and property.

NYC **G107.5 Records.** The Board of Standards and Appeals shall:

1. Maintain a record of all variance actions, including justification for their issuance; and
2. Report such variances issued in its biennial report submitted to the Federal Emergency Management Agency (FEMA).

## CHAPTER G2 DEFINITIONS

### SECTION BC G201 DEFINITIONS

**G201.1 General.** The following words and terms shall, for the purposes of this appendix, have the meanings shown herein.

#### **G201.2 Definitions.**

**500-YEAR FLOOD ELEVATION.** The elevation of the flood having a 0.2-percent chance of being equaled or exceeded in any given year, as specified on FEMA FIRM 360497 or FEMA FIS 360497.

**A-ZONE.** An area of special flood hazard without high velocity wave action. When not shown on the FIRMs, the water surface elevation may be determined from available data by the registered design professional of record in accordance with Section G103.3. See also "Area of special flood hazard."

**AREA OF SPECIAL FLOOD HAZARD.** The land in the flood plain delineated as subject to a 1-percent or greater chance of flooding in any given year. Such areas are designated on the Flood Insurance Rate Map (FIRM) as A-Zones, Limit of Moderate Wave Action (Coastal A-Zones), or V-Zones. Such areas are also known as the base flood plain or 100 year floodplain. Areas designated as X-Zones shall not be deemed areas of special flood hazard for the purposes of this Appendix.

**BASE FLOOD.** The flood having a 1-percent chance of being equaled or exceeded in any given year.

**BASE FLOOD ELEVATION.** The elevation of the base flood, including wave height, as specified on FEMA FIRMs 360497 or as determined in accordance with Section G103.3. In areas designated as ZONE AO, the base flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map.

**BASEMENT (FOR FLOOD ZONE PURPOSES).** The portion of a building having its floor subgrade (below ground level) on all sides.

**BREAKAWAY WALL.** An open lattice wall that is not part of the structural support of the building to which it is attached and that is intended through its design and construction to collapse under specific later loading forces without causing damage to the elevated portion of the building or the supporting foundation system.

**COASTAL A-ZONE.** An area within a special flood hazard area, shown on FEMA FIRMs 360497 as an area bounded by a "Limit of Moderate Wave Action," landward of a V-Zone or landward of an open coast without mapped V-Zones. In a Coastal A-Zone, the principal source of flooding must be astronomical tides, storm surges, seiches, or tsunamis, and not riverine flooding. During the base flood conditions, the potential for breaking wave heights must be greater than or equal to 1 foot, 6 inches (457 mm). In no case shall an area of special flood hazard be deemed a coastal A-Zone unless and



until it has been identified as such on the adopted FEMA FIRMs 360497.

**DESIGN FLOOD ELEVATION.** The applicable elevation specified in ASCE 24, Tables 2-1, 4-1, 5-1, 6-1, or 7-1, depending on the structural occupancy category designated in ASCE 24, Table 1-1.

**DEVELOPMENT.** Any man-made change to improved or unimproved real estate, including but not limited to, buildings or other structures, temporary structures, temporary or permanent storage of materials, mining, dredging, filling, grading, paving, excavations, operations and other land disturbing activities.

**EXISTING CONSTRUCTION.** See “Pre-FIRM development.”

**EXISTING STRUCTURE.** See “Pre-FIRM development.”

**FLOOD or FLOODING.** A general and temporary condition of partial or complete inundation of normally dry land from:

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

**FLOOD-DAMAGE-RESISTANT MATERIALS.** Any construction material, including finishes, capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair.

**FLOOD INSURANCE RATE MAP (FIRM).** The flood official map on which the Federal Emergency Management Agency (FEMA) has delineated areas of special flood hazard, base flood elevations, and the flood boundary and floodways.

**FLOOD INSURANCE STUDY (FIS).** The official report provided by the Federal Emergency Management Agency (FEMA) containing the Flood Insurance Rate Map (FIRM), the water surface elevation of the base flood and supporting technical data.

**FLOODPROOFING, DRY.** For buildings and structures that are nonresidential (for flood zone purposes), a combination of design modifications that results in the building's or structure's being water tight to the design flood elevation, including the attendant utility and sanitary facilities, with walls substantially impermeable to the passage of water and with structural components having the capacity to resist loads as identified in ASCE 7.

**FLOODPROOFING, WET.** A floodproofing method designed to permit parts of the structure below the design flood elevation that are used for parking, storage, building access, or crawl space to intentionally flood, by equalizing hydrostatic pressures and by relying on the use of flood damage-resistant materials and construction techniques.

**FLOODWAY.** The channel of the river, creek or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Floodways are mapped only in the Boroughs of the Bronx and Staten Island.

**FUNCTIONALLY DEPENDENT FACILITY.** A facility that cannot be used for its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading or unloading of cargo or passengers, shipbuilding or ship repair. The term does not include long-term storage, manufacture, sales or service facilities.

**HISTORIC STRUCTURE.** A pre-FIRM building or structure:

1. Designated as a landmark or located within an historic district designated by the New York City Landmarks Preservation Commission;
2. Listed or preliminarily determined to be eligible for listing in the National or State Register of Historic Places; or
3. Determined by the Secretary of the U.S. Department of the Interior or the New York State Department of Parks and Recreation as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.

**LETTER OF MAP AMENDMENT (LOMA).** An official amendment to the FIRM, issued and approved by the Federal Emergency Management Agency (FEMA), removing structures or tax lots or portions of tax lots from areas of special flood hazard, resulting from a demonstration that the pre-FIRM ground elevations are at or above the base flood elevation.

**LETTER OF MAP REVISION BASED ON FILL (LOMR-F).** An official amendment to the FIRM, issued and approved by the Federal Emergency Management Agency (FEMA), removing structures or tax lots or portions of tax lots from areas of special flood hazard, resulting from the post-FIRM placement of compacted fill, such that the new ground elevation is at or above the base flood elevation.

**LETTER OF MAP REVISION (LOMR).** An official amendment to the FIRM, issued and approved by the Federal Emergency Management Agency (FEMA), removing or adding structures or tax lots or portions of tax lots from areas of special flood hazard, which generally results from physical measures implemented that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective base flood elevations, or the special flood hazard area.

**LOWEST FLOOR.** The lowest floor of the lowest enclosed area, including crawl spaces and basements (for flood zone purposes).

**Exception:** The lowest floor shall not include any wet floodproofed spaces usable solely for vehicle parking, building access, storage or crawl space, provided that such enclosure is not built so as to render the structure in violation of this appendix, including that:

1. Such enclosure shall allow for the automatic entry and exit of floodwaters;
2. Such enclosure shall be constructed solely of flood-resistant materials and finishes;

3. Such enclosure shall have a floor elevation equal to or higher than the outside adjacent grade on at least one side; and
4. Such outside adjacent grade shall slope down, towards the source of flooding, providing positive drainage by gravity, thus preventing accumulations of water under or in the structure after the floodwaters recede without the use of pumps, pipes or drains.

**MANUFACTURED HOME.** A structure that is transportable in one or more sections, built on a permanent chassis, designed for use with or without a permanent foundation when attached to the required utilities, and constructed to the Federal Mobile Home Construction and Safety Standards and rules and regulations promulgated by the U.S. Department of Housing and Urban Development. The term also includes mobile homes, park trailers, travel trailers and similar transportable structures that are placed on a site for 180 consecutive days or longer.

**MANUFACTURED HOME PARK OR SUBDIVISION.** A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

**MARKET VALUE OF STRUCTURE.** The price that a buyer is willing, but is not under any duty, to pay for a particular structure to an owner who is willing, but not obligated, to sell, exclusive of the value of the land, or of other buildings or structures on the same tax lot. The market value of a structure shall be determined in accordance with rules promulgated by the commissioner.

**NATIONAL GEODETIC VERTICAL DATUM (NGVD).** The national vertical datum standard established in 1929; used as a reference for establishing elevations within a flood plain.

**NEW CONSTRUCTION.** See “Post-FIRM development.”

**NONRESIDENTIAL (FOR FLOOD ZONE PURPOSES).**

A building or structure that either:

1. Contains no space classified in Group I-1, R-1, R-2, or R-3, and contains no space that is accessory, as such term is defined in the *New York City Zoning Resolution*, to any Group I-1, R-1, R-2, or R-3 occupancy; or
2. Contains such space(s), but also contains space on the lowest floor that is not accessory, as such term is defined in the *New York City Zoning Resolution*, to a Group I-1, R-1, R-2, or R-3 occupancy.

**NORTH AMERICAN VERTICAL DATUM (NAVD).** The national vertical datum standard established in 1988, used as a reference for establishing elevations within a flood plain.

**PATIENT CARE AREA (FOR FLOOD ZONE PURPOSES).** Any space meeting the following conditions:

1. The space is located within a building or structure, or portion thereof, that is classified in Group I-2; and
2. The space is primarily used for the provision of medical services to persons, including, but not limited to, con-

sultation, evaluation, monitoring and treatment services.

**Exceptions:** The following spaces shall not be considered patient care areas (for flood zone purposes):

1. “Emergency rooms or departments” as defined in 10 NYCRR 700.2(a)(2) and
2. Spaces primarily used for the provision of medical services identified in 10 NYCRR 703.6(c)(2)(i).

**PRE-FIRM DEVELOPMENT.** Any development:

1. Completed prior to November 16, 1983;
2. Under construction on November 16, 1983 provided that the start of construction was prior to said date; or
3. Completed on or after November 16, 1983 but that:
  - 3.1. Was not located within an area of special flood hazard at the start of construction; and
  - 3.2. Is now located within an area of special flood hazard as a result of a subsequent change to the FIRM.

**PRE-FIRM STRUCTURE.** See “Pre-FIRM Development.”

**POST-FIRM DEVELOPMENT.** Any development that is not pre-FIRM development.

**POST-FIRM STRUCTURE.** See “Post-FIRM Development.”

**RECREATIONAL VEHICLE.** A vehicle that is built on a single chassis, 400 square feet (37.16 m<sup>2</sup>) or less when measured at the largest horizontal projection, designed to be self-propelled or permanently towable by a light-duty truck, and designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel or seasonal use. A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick disconnect-type utilities and security devices and has no permanently attached additions.

**RESIDENTIAL (FOR FLOOD ZONE PURPOSES).** A building or structure containing any space that is either:

1. Classified in Group I-1, R-1, R-2, or R-3; or
2. Accessory, as such term is defined in the *New York City Zoning Resolution*, to any Group I-1, R-1, R-2, or R-3 occupancy.

**Exception:** Such a building or structure shall be considered nonresidential (for flood zone purposes) when also containing space on the lowest floor that is not accessory, as such term is defined in the *New York City Zoning Resolution*, to a Group I-1, R-1, R-2, or R-3 occupancy.

**SAND DUNES.** Naturally occurring accumulations of sand in ridges or mounds landward of a beach.

**SHADED X-ZONE.** The land in the floodplain delineated as subject to a 0.2-percent or greater chance of flooding, but less than one percent chance of flooding, in any given year. Such areas are designated on the Flood Insurance Rate Map (FIRM) as shaded X-Zones.

**SPECIAL FLOOD HAZARD AREA.** See “Area of special flood hazard.”

**START OF CONSTRUCTION.** The date of permit issuance for: (i) post-FIRM developments; (ii) substantial improvements to pre-FIRM structures; and (iii) those pre-FIRM developments that, at the time of permit issuance, were not within an area of special flood hazard but that, prior to completion, were within an area of special flood hazard as a result of map change; provided the actual commencement of construction, repair, reconstruction, rehabilitation, addition, placement or other improvement is within 180 days after the date of permit issuance and such construction activity is not thereafter suspended or abandoned for 180 days or more. For the purposes of this definition:

1. The actual commencement of construction means the first placement of permanent construction of a building (including a manufactured home or prefabricated building) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns.
2. Permanent construction does not include land preparation (such as clearing, excavation, grading or filling), the installation of streets or walkways, excavation for abasement (for flood zone purposes), footings, piers or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building.
3. For a substantial improvement, the actual commencement of construction means the first alteration of any wall, ceiling, floor or other structural part of a building, regardless of whether that alteration affects the external dimensions of the building.

**SUBSTANTIAL DAMAGE.** Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

**SUBSTANTIAL IMPROVEMENT.** Any repair, reconstruction, rehabilitation, addition or improvement of a building or structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the improvement or repair is started. If the structure has sustained substantial damage, any repairs are considered substantial improvement regardless of the actual repair work performed. The term does not, however, include either:

1. Any project for improvement of a building required to correct pre-FIRM health, sanitary or safety code violations identified by the commissioner, the Fire Commissioner, the Commissioner of Housing Preservation and Development, or the Commissioner of Health and Mental Hygiene, and that are the minimum necessary to assure safe living conditions; or
2. Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

**VARIANCE.** A grant of relief from the requirements of this appendix, which permits construction in a manner otherwise prohibited by this appendix.

**V-ZONE.** An area of special flood hazard subject to high-velocity wave action.

## CHAPTER G3 CONSTRUCTION STANDARDS

### SECTION BC G301 GENERAL

**G301.1 All developments.** To the extent required by Section G102.1, all developments, including but not limited to utility installation, site improvements, placement of prefabricated buildings and manufactured homes, new building construction, alterations and repairs, shall be designed and constructed to resist the effects of flood hazards and flood loads in accordance with this appendix and ASCE 24.

**G301.1.1 Multiple flood zones.** For a structure that is located in more than one zone (for instance both an A-Zone and an X-Zone, or both an A-Zone and a V-Zone), the provisions associated with the most restrictive area of special flood hazard shall apply to the entire structure.

**G301.2 Design requirements and load combinations.** Any construction within the scope of Section G102.1, located in a special flood hazard area, shall be designed and constructed to resist the loads and load combinations specified in Chapter 16.

### SECTION BC G302 SUBDIVISIONS

**G302.1 General.** Any subdivision proposal, including proposals for manufactured home parks and subdivisions, or other proposed new development within an area of special flood hazard shall demonstrate that:

1. All such proposals are consistent with the need to minimize flood damage;
2. All public utilities and facilities, such as sewer, gas, electric and water systems, are located and constructed to minimize or eliminate flood damage; and
3. Adequate drainage is provided to reduce exposure to flood hazards.

**G302.2 Subdivision requirements.** The following requirements shall apply to any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within an area of special flood hazard:

1. The area of special flood hazard, including floodways and V-Zones, as appropriate, shall be delineated on tentative and final subdivision plats;
2. Base flood elevations shall be shown on tentative and final subdivision plats;
3. Building lots shall be provided with adequate buildable area, in accordance with the *New York City Zoning Resolution*, outside the floodway; and



- NYC 4. The design criteria for any utilities and facilities, as set  
 NYC forth in this appendix and appropriate *New York City*  
 NYC *Construction Codes*, shall be met.  
 NYC

### SECTION BC G303 SITE IMPROVEMENT

NYC **G303.1 Development in floodways.** Development or land  
 NYC disturbing activity is prohibited in floodways unless it has  
 NYC been demonstrated through hydrologic and hydraulic analy-  
 NYC ses performed in accordance with standard engineering prac-  
 NYC tice that the proposed encroachment will not result in any  
 NYC increase in the level of the base flood, in accordance with  
 NYC Section G103.5.  
 NYC

NYC **G303.2 Sewer facilities.** All new and replaced sanitary  
 NYC sewer facilities, private sewage treatment plants (including  
 NYC all pumping stations and collector systems) and on-site waste  
 NYC disposal systems shall be designed in accordance with Chap-  
 NYC ter 7, ASCE 24, to minimize or eliminate infiltration of  
 NYC floodwaters into the facilities and discharge from the facili-  
 NYC ties into floodwaters, or impairment of the facilities and sys-  
 NYC tems.

NYC **G303.3 Water facilities.** All new and replacement water  
 NYC facilities shall be designed in accordance with the provisions  
 NYC of Chapter 7, ASCE 24 to minimize or eliminate infiltration  
 NYC of floodwaters into the systems.

NYC **G303.4 Storm drainage.** Storm drainage shall be designed  
 NYC to convey the flow of surface waters to minimize or elimi-  
 NYC nate damage to persons or property and shall meet the  
 NYC requirements of ASCE 24.

NYC **G303.5 Streets and sidewalks.** Streets and sidewalks shall  
 NYC be designed to minimize potential for increasing or aggravat-  
 NYC ing flood levels and shall meet the requirements of Section  
 NYC G303.7.

NYC **G303.6 Retaining walls and driveways.** Retaining walls  
 NYC and driveways shall meet the requirements of Section  
 NYC G303.7.

NYC **G303.7 Grading and fill.** In areas of special flood hazard  
 NYC grading and/or fill shall not be approved:

- NYC 1. Unless such fill is placed, compacted and sloped to  
 NYC minimize shifting, slumping and erosion during the rise  
 NYC and fall of flood water and, as applicable, wave action,  
 NYC in accordance with ASCE 24.
- NYC 2. In floodways, unless it has been demonstrated through  
 NYC hydrologic and hydraulic analyses performed by an  
 NYC engineer in accordance with standard engineering prac-  
 NYC tice that the proposed grading or fill, or both will not  
 NYC result in any increase in the flood levels during the  
 NYC occurrence of the design flood, in accordance with Sec-  
 NYC tion G103.5.
- NYC 3. In coastal† A-Zones and V-Zones, unless such fill is  
 NYC conducted and or placed to avoid diversion of water  
 NYC and waves towards any building or structure.

### SECTION BC G304 POST-FIRM CONSTRUCTION AND SUBSTANTIAL IMPROVEMENTS

**G304.1 A-Zone construction standards.** In addition to the  
 requirements of ASCE 24, the following standards shall  
 apply to post-FIRM construction and substantial improve-  
 ments located within A-Zones, other than Coastal A-Zones.

**G304.1.1 Residential.** For buildings or structures that are  
 residential (for flood zone purposes), all post-FIRM new  
 buildings and substantial improvements shall comply  
 with the applicable requirements in Chapter G3 of this  
 code and ASCE 24, and shall be elevated as follows:

1. **Lowest floor.** The lowest floor, including the base-  
 ment (for flood zone purposes), shall be elevated to  
 at or above the design flood elevation specified in  
 ASCE 24, Table 2-1;
2. **Enclosures below the design flood elevation.** En-  
 closed spaces below the design flood elevation  
 specified in ASCE 24, Table 2-1, shall be useable  
 solely for parking of vehicles, building access, stor-  
 age, or crawlspace, and shall be wet floodproofed in  
 accordance with ASCE 24. Breakaway walls are not  
 required in A-Zones;
3. **Under-floor spaces.** The finished ground level of an  
 under-floor space, such as a crawl space, shall be  
 equal to or higher than the outside finished ground  
 level on at least one side;
4. **Materials.** Only flood-damage-resistant materials  
 and finishes shall be utilized below the design flood  
 elevation specified in ASCE 24, Table 5-1;
5. **Utilities and equipment.** Utilities and attendant  
 equipment shall be located at or above the design  
 flood elevation specified in ASCE 24, Table 7-1, or  
 shall be constructed so as to prevent water from  
 entering or accumulating within the components  
 during conditions of flooding in accordance with  
 ASCE 24;
- 5.1. Fire protection systems and equipment. The fol-  
 lowing fire protection systems and equipment  
 shall be located at or above the design flood ele-  
 vation specified in ASCE 24, Table 7-1, except  
 that where the system or equipment or portion  
 thereof serves only spaces located below such  
 design flood elevation, the system or equipment  
 or portion thereof may be located below such  
 design flood elevation:
  - 5.1.1. Sprinkler control valves that are not out-  
 side stem and yoke valves;
  - 5.1.2. Fire standpipe control valves that are not  
 outside stem and yoke valves;
  - 5.1.3. Sprinkler booster pumps and fire pumps;
  - 5.1.4. Dry pipe valve-related electrically oper-  
 ated alarm appurtenances;
  - 5.1.5. Alarm control panels for water and non-  
 water fire extinguishing systems;



- 5.1.6. Alarm control panels for sprinkler systems, pre-action sprinkler systems, deluge sprinkler systems, and combined dry pipe and pre-action sprinkler systems;
- 5.1.7. Electrically operated waterflow detection devices serving sprinkler systems; and
- 5.1.8. Air compressors serving sprinkler systems and pre-action sprinkler systems.
- 5.2. Fire alarm systems and components. Where a zoning indicator panel is provided at the main building entrance in accordance with Section 907.6.3.1 and such panel is located at or below 5 feet (1524 mm) above the design flood elevation specified in ASCE 24, Table 7-1, at least one secondary zoning indicator panel complying with the following requirements shall be provided:
- 5.2.1. The secondary zoning indicator panel, associated controls, power supplies and means of transferring control shall be provided at least 5 feet (1524 mm) above the design flood elevation specified in ASCE 24, Table 7-1, in a location accessible to responding Fire Department personnel and approved by the department and the Fire Department; and
- 5.2.2. Where the secondary zoning indicator panel or associated controls are only operable upon transfer of control from another zoning indicator panel, such transfer shall be by a means that is approved by the Fire Department.
- 5.3. Fuel-oil piping systems. The following requirements shall apply to fuel-oil piping systems, as defined by Section 202 of the *New York City Mechanical Code*:
- 5.3.1. Fill piping that does not terminate in a watertight terminal approved by the department shall terminate at least 3 feet (914 mm) above the design flood elevation specified in ASCE 24, Table 7-1; and
- 5.3.2. Normal vent piping and emergency vent piping shall terminate at least 3 feet (914 mm) above the design flood elevation specified in ASCE 24, Table 7-1.
- 5.4. Plumbing systems and components. The structure shall comply with the following requirements:
- 5.4.1. Relief vents and fresh air intakes. Relief vents and fresh air intakes serving building traps in accordance with Section 1002.6 of the *New York City Plumbing Code* shall be carried above grade and shall terminate in a screened outlet that is located outside of the building and at or

above the design flood elevation specified in ASCE 24, Table 7-1; and

- 5.4.2. Reduced pressure zone backflow preventers. Reduced pressure principle backflow preventers complying with Section 608.13.2 of the *New York City Plumbing Code* and backflow preventers with intermediate atmospheric vents complying with Section 608.13.3 of the *New York City Plumbing Code* shall be located at or above the design flood elevation specified in ASCE 24, Table 7-1.

6. **Certifications.** Applications shall contain applicable certifications in accordance with Section G104.5; and

7. **Special inspections.** Special inspections shall be as required by Section G105.

**G304.1.2 Nonresidential.** For buildings or structures that are nonresidential (for flood zone purposes), all post-FIRM new buildings and substantial improvements shall comply with the applicable requirements in Chapter G3 of this code and ASCE 24, and shall comply with either of the following:

1. **Elevation option.** The structure shall comply with Items 1 through 7 of Section G304.1.1; or
2. **Dry floodproofing option.** The structure shall comply with the following:

- 2.1. Elevation of dry floodproofing. The structure shall be dry floodproofed to at or above the design flood elevation specified in ASCE 24, Table 6-1;

- 2.2. Dwelling units, patient care areas (for flood zone purposes) and sleeping areas. Where dwelling units, patient care areas (for flood zone purposes) or spaces intended to be used by persons for sleeping purposes are located in a building utilizing the dry floodproofing option, the following additional requirements shall be met:

- 2.2.1. All rooms and spaces within dwelling units, patient care areas (for flood zone purposes) and all spaces intended to be used by persons for sleeping purposes shall be located at or above the design flood elevation;

- 2.2.2. A restrictive declaration noting the above restriction shall be filed with the City Register or County Clerk, and the page number and liber number shall be identified in the permit application and on the certificate of occupancy.

- 2.3. Utilities and equipment. Utilities and attendant equipment shall be located within the dry floodproofed enclosure, or may be located outside the dry floodproofed enclosure provided that they are located at or above the design flood elevation specified in ASCE 24, Table 7-1, or

are constructed so as to prevent water from entering or accumulating within the components during conditions of flooding in accordance with ASCE 24.

2.3.1. Additional requirements. The structure shall comply with Items 5.1 through 5.4 of Section G304.1.1.

2.4. Certifications. Applications shall contain applicable certifications in accordance with Section G104.5; and

2.5. Special inspections. Special inspections shall be as required by Section G105.

**G304.2 V-Zone construction standards.** In addition to the requirements of ASCE 24, the following standards shall apply to post-FIRM construction and substantial improvements located within V-Zones.

1. **Foundation.** The lowest floor shall be elevated on adequately anchored pilings or columns and securely anchored to such piles or columns to prevent floatation, collapse and lateral movement resulting from wind and flood loads acting simultaneously on all building components, and other load requirements of Chapter 16 and this appendix.
2. **Lowest horizontal member.** The lowest portion of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) shall be at or above the design flood elevation specified in ASCE 24, Table 4-1.
3. **Below the lowest horizontal member.** Spaces below the lowest horizontal member shall be either:
  - 3.1. Free of obstructions; or
  - 3.2. Enclosed with breakaway walls providing unconditioned space useable solely for parking of vehicles, building access, storage or crawl space. Such breakaway walls shall:
    - 3.2.1. Be of an open lattice type construction only;
    - 3.2.2. Meet the load requirements of Section 5.3.3 of ASCE 7; and
    - 3.2.3. Meet the additional requirements of ASCE 24.
4. **Materials.** Only flood-damage-resistant materials and finishes shall be utilized below the design flood elevation specified in ASCE 24, Table 5-1;
5. **Utilities and equipment.** Utilities and attendant equipment shall be located at or above the design flood elevation specified in ASCE 24, Table 7-1, or shall be constructed so as to both resist the wave action and prevent water from entering or accumulating within the components during conditions of flooding in accordance with ASCE 24;
  - 5.1. Additional requirements. The structure shall comply with Items 5.1 through 5.4 of Section G304.1.1.

6. **Prohibitions.** The following shall be prohibited in V-Zones:

- 6.1. Development, including land-disturbing activities, seaward of the reach of mean high tide;
- 6.2. Use of fill for structural support of buildings; and
- 6.3. Man-made alterations of sand dunes that would increase potential damage to buildings.

7. **Certifications.** Applications shall contain applicable certifications in accordance with Section G104.5; and

8. **Special inspections.** Special inspections shall be as required by Section G105.

**G304.3 Coastal A-Zone construction standards.** In addition to the requirements of ASCE 24, all post-FIRM new buildings and substantial improvements in a Coastal A-Zone shall comply with the V-Zone construction standards of Section G304.2.

**Exceptions:** The following structural systems shall be permitted in a Coastal A-Zone:

1. **Wave-resisting stem wall foundation.** Stem walls supporting a floor system above, and backfilled with soil or gravel to the underside of the floor system, shall be permitted in Coastal A-Zones. The design and construction of the shallow foundation system shall comply with the following:
  - 1.1. The underside of such floor system shall be located at or above the design flood elevation specified in ASCE 24, Table 4-1.
  - 1.2. Stem walls enclosing areas below the design flood elevation shall not be permitted. Stem walls shall be designed to transfer all vertical and lateral forces to the slab above and to the foundation elements below;
  - 1.3. The design shall consider all forces resulting from flooding, including wave action, debris impact, erosion, and local scour;
  - 1.4. The design shall consider all forces resulting from soil pressure behind the walls, including the effect of hydrostatic loads, and all live and dead surcharge loads from the slab above;
  - 1.5. Flood openings shall not be required in stem walls constructed in accordance with this section;
  - 1.6. Where soils are susceptible to erosion and local scour, stem walls shall be supported by deep footings;
  - 1.7. Shallow foundations including spread footing, mat and raft foundations shall be designed to prevent sliding, uplift, or overturning when exposed to the combination of loads in ASCE Section 1.6.2.
2. **Wave-resisting dry floodproofing wall and foundation system.** Buildings that are non-residential (for flood zone purposes) and that are located in Coastal A-Zones shall be permitted to be dry floodproofed in

accordance with Section G304.1.2 provided the structure is dry floodproofed to at or above the design flood elevation specified in ASCE 24, Table 6-1. For buildings or structures utilizing this exception, construction documents shall include calculations demonstrating that the foundation and building, including flood shields if provided, will resist the wave action, including the combination of loads in ASCE Section 1.6, to at or above the design flood elevation specified in ASCE 24, Table 4-1.

**G304.4 Construction standards for shaded X-Zones.** In shaded X-Zones, buildings that include I-2 occupancies that are hospitals shall comply with the requirements of this chapter and the applicable provisions of ASCE 24 for A-Zone construction.

**G304.5 Additional construction standards with respect to connections for temporary external generators, boilers and chillers.** In addition to the other requirements of this chapter, connections for temporary external generators, boilers and chillers shall be provided in accordance with Sections G304.5.1 through G304.5.4.

**G304.5.1 Group I-1 and adult homes, enriched housing, community residences and intermediate care facilities.** An occupancy that is classified as Group I-1, or that is an adult home, enriched housing, community residence or intermediate care facility and classified as Group R pursuant to an exception to Section 308.2.1 or 308.2.2, shall comply with the following requirements:

1. **Connections for temporary external generators.** Electrical connections shall be provided allowing for the connection of temporary external generators capable of providing power for at least 72 hours for, at a minimum, the following systems:

- 1.1. Exit signs and means of egress illumination required by Chapter 10 and serving such occupancy;
- 1.2. Fire alarm systems serving such occupancy;
- 1.3. For buildings having occupied floors located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access, at least one elevator that serves all floors; and
- 1.4. Lighting in such occupancy, sufficient to maintain illumination in accordance with Section 1205.3, for (i) spaces primarily used for the provision of medical services to persons, including, but not limited to, consultation, evaluation, monitoring and treatment services and (ii) spaces intended to be used by persons for sleeping purposes.

**Exception†:** Connections for temporary external generators shall not be required for buildings with emergency or standby power systems that are permanently installed above the design flood elevation specified in Table 7-1 of ASCE 24 and capable of providing power for at least 72 hours to the systems identified in Item 1 of Section G304.5.1. Natural gas shall be a permitted fuel supply.

2. **Flood protection for temporary external generator connections.** Electrical connections installed in accordance with Item 1 of Section G304.5.1 shall be located at or above the design flood elevation specified in Table 7-1 of ASCE 24.

3. **Emergency connection plan.** Prior to sign-off of work by the department, a plan shall be submitted to the department that identifies how the temporary external generators will be connected and capable of providing power for the occupancy in accordance with Item 1 of Section G304.5.1 within 72 hours after failure of the normal power supply.

**G304.5.2 Group I-2 hospitals.** An occupancy that is a Group I-2 hospital shall comply with the following requirements:

1. **Connections for temporary external generators.** Electrical connections shall be provided allowing for the connection of temporary external generators capable of providing power for at least 72 hours for, at a minimum, the following systems:

- 1.1. All electrical services serving such occupancy for which emergency or standby power must be provided in accordance with any other applicable local, state or federal law or rule; and
- 1.2. Air conditioning and cooling systems serving such occupancy, sufficient to maintain temperature and humidity in accordance with Section 1204, for (i) spaces primarily used for the provision of medical services to persons, including, but not limited to, consultation, evaluation, monitoring and treatment services and (ii) spaces intended to be used by persons for sleeping purposes.

**Exception:** Connections for temporary external generators shall not be required for buildings that have emergency or standby power systems that are permanently installed above the design flood elevation specified in Table 7-1 of ASCE 24 and capable of providing power for at least 72 hours to the systems identified in Item 1 of Section G304.5.2. Natural gas shall be a permitted fuel supply.

2. **Connections for temporary external boilers and chillers.** Where boiler and chiller plants are located below the design flood elevation specified in Table 7-1 of ASCE 24 and serve (i) spaces primarily used for the provision of medical services to persons, including, but not limited to, consultation, evaluation, monitoring and treatment services or (ii) spaces intended to be used by persons for sleeping purposes, connections shall be provided to allow for the connection of temporary external boilers and chillers capable of maintaining temperature and humidity for such spaces in accordance with Section 1204 for at least 72 hours.
3. **Flood protection for temporary external generator, boiler and chiller connections.** Electrical con-



nections installed in accordance with Item 1 of Section G304.5.2 and connections installed in accordance with Item 2 of Section G304.5.2 shall be located at or above the design flood elevation specified in Table 7-1 of ASCE 24.

4. **Emergency connection plan.** Prior to sign-off of work by the department, the following shall be submitted to the department:

- 4.1. For an occupancy required to comply with Item 1 of Section G304.5.2, a plan that identifies how the temporary external generators will be connected and capable of providing power for the occupancy in accordance with such item within 72 hours after failure of the normal power supply; and

- 4.2. For an occupancy required to comply with Item 2 of Section G304.5.2, a plan that identifies how the temporary external boilers and chillers will be connected and capable of maintaining temperature and humidity for specified spaces in accordance with Section 1204 within 72 hours after failure of the primary boiler and chiller plants.

**G304.5.3 Group I-2 nursing homes.** An occupancy that is a Group I-2 nursing home shall comply with Section G304.5.2.

**Exception:** Such occupancy is not required to comply with Items 1.2, 2 and 4.2 of Section G304.5.2.

**G304.5.4 Group I-2 occupancies, other than hospitals and nursing homes.** A Group I-2 occupancy, other than a hospital or a nursing home, shall comply with Section G304.5.1.

## SECTION BC G305 MANUFACTURED HOMES

**G305.1 General.** Manufactured homes shall be prohibited in V-Zones. Within A-Zones, all new, replaced or substantially improved manufactured homes shall be:

1. Installed using methods and practices that minimize flood damage;
2. Elevated to or above the design flood elevation specified in ASCE 24, Table 2-1;
3. Placed on a permanent, reinforced foundation that is designed in accordance with ASCE 24; and
4. Securely anchored to a foundation system designed to resist flotation, collapse and lateral movement. Methods of anchoring are authorized to include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

## SECTION BC G306 RECREATIONAL VEHICLES

**G306.1 General.** The following shall apply to placement of all recreational vehicles within areas of special flood hazard:

1. Placement in V-Zones and floodways prohibited. The placement of recreational vehicles is prohibited in V-Zones and floodways.
2. Temporary placement in A-Zones. Within A-Zones, recreational vehicles shall be fully licensed and ready for highway use, and shall be placed on a site for less than 180 consecutive days.
3. Permanent placement in A-Zones. Within A-Zones, recreational vehicles that are not fully licensed and ready for highway use, or that are to be placed on a site for 180 or more consecutive days, shall meet the requirements of Section G305 for manufactured homes.

## SECTION BC G307 TANKS

**G307.1 Underground tanks.** Underground tanks in areas of special flood hazard shall be designed, constructed, installed, and anchored to prevent flotation, collapse and lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of flooding to the design flood elevation, in accordance with ASCE 24.

**G307.2 Above-ground tanks.** Above-ground tanks in areas of special flood hazard shall be:

1. Elevated to or above the design flood elevation specified in ASCE 24, Table 7-1; or
2. Designed, constructed, installed, and anchored to prevent flotation, collapse and lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of flooding to the design flood elevation, in accordance with ASCE 24.

**G307.3 Tank inlets and vents.** In areas of special flood hazard, tank inlets, fill openings, outlets and vents shall be:

1. Installed at or above the design flood elevation specified in ASCE 24, Table 7-1, or fitted with covers designed to prevent the inflow of floodwater and outflow of the contents of the tanks during conditions of flooding to the design flood elevation, in accordance with ASCE 24; and
2. Anchored to prevent lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of flooding to the design flood elevation, in accordance with ASCE 24.

**G307.4 Additional fuel-oil storage capacity.** Fuel-oil storage capacity in areas of special flood hazard and shaded X-Zones shall comply with the following:

1. In areas of special flood hazard, fuel oil on the lowest story having its floor above the applicable design flood elevation shall be limited to 3,000 gallons (11 356 L) and no storage tank may exceed the lesser of 1,500 gal-



lons (5678 L) or the quantity of fuel-oil needed to operate the emergency or standby generator(s) served by such tank for 24 hours and

2. In shaded X-Zones, fuel oil on the lowest story having its floor above the 500-year flood elevation shall be limited to 3,000 gallons (11 356 L) and no storage tank may exceed the lesser of 1,500 gallons (5678 L) or the quantity of fuel-oil needed to operate the emergency or standby generator(s) served by such tank for 24 hours.

**G307.4.1 Additional requirements.** Where fuel-oil storage capacity exceeds the quantity set forth in Section 1305.11.1.3 of the *New York City Mechanical Code*, the fuel-oil storage shall comply with Sections G307.4.1.1 and G307.4.1.2 in addition to Section 1305 of the *New York City Mechanical Code*.

**G307.4.1.1 Vault.** Each fuel-oil storage tank shall be separately enclosed in a vault complying with the following requirements:

1. The walls, floor, and top of such vault shall have a fire resistance rating of not less than 3 hours;
2. The walls of such vault shall be bonded to the floor of such vault;
3. The top and walls of such vault shall be independent of the building structure;
4. An exterior building wall having a fire resistance rating of not less than 3 hours shall be permitted to serve as a wall of such vault; and
5. The vault shall be located in a dedicated room or area of the building that is separated vertically and horizontally from other areas of the building by construction having a fire resistance rating of not less than 2 hours.

**G307.4.1.2 Extinguishing system.** Fuel-oil storage shall be protected with an alternative automatic fire-extinguishing system complying with Section 904.

**G307.5 Elevation of certain tanks and containers serving critical facilities.** The following tanks and containers shall be located at or above the design flood elevation specified in ASCE 24, Table 7-1, unless such tanks and containers serve buildings that include I-2 occupancies that are hospitals, in which case such tanks and containers shall be located at or above the greater of (i) the design flood elevation specified in ASCE 24, Table 7-1, or (ii) the 500-year flood elevation. Such tanks and containers must be designed to maintain service to such structure during flood conditions and shall comply with section 9.6 of ASCE 24;

1. Medical and compressed gas storage tanks, oxygen tanks, and other cryogenic system storage tanks;
2. Hazardous material storage tanks;
3. Stationary compressed gas containers;
4. Stationary cryogenic containers; and
5. Stationary flammable gas storage containers.

## SECTION BC G308 OTHER BUILDING WORK

**G308.1 Detached accessory structures.** Detached accessory structures shall be anchored to prevent flotation, collapse and lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of flooding to the design flood elevation. Enclosed accessory structures usable solely for parking or storage shall be wet floodproofed and shall have flood openings to allow for the automatic entry and exit of flood waters designed in accordance with ASCE 24.

**G308.2 Fences.** Fences in floodways that may block the passage of floodwaters, such as stockade fences and wire mesh fences, shall meet the requirement of Section G103.5.

**G308.3 Oil derricks.** Oil derricks located in areas of special flood hazard shall be designed in conformance with ASCE 24.

**G308.4 Retaining walls, sidewalks and driveways.** Retaining walls, sidewalks and driveways shall meet the requirements of Section G303.7.

**G308.5 Prefabricated swimming pools in floodways.** Prefabricated swimming pools in floodways shall meet the requirements of Section G103.5.

**G308.6 Temporary flood shields.** Temporary flood shields shall be permitted in accordance with Section 6.2.3 of ASCE 24.

**G308.7 Temporary stairs and ramps.** Temporary stairs and ramps shall comply with the requirements of Sections G308.7.1 and G308.7.2.

**G308.7.1 Evacuated buildings.** Temporary stairs and ramps shall be permitted to provide elevated ingress and egress in compliance with Item 3 of Section 6.2.2 of ASCE 24 for buildings or portions of buildings that are planned to be evacuated during design flood conditions, except for maintenance and emergency personnel, provided that such temporary stairs and ramps shall not be permitted to serve as a required means of egress for a dwelling unit or for any area described in Item 2.2.1 of Section G304.1.2 required to be located at or above the design flood elevation.

**G308.7.2 Existing buildings.** Temporary stairs and ramps for an existing building or portions thereof shall be permitted to provide elevated ingress and egress in compliance with Item 3 of Section 6.2.2 of ASCE 24, including as a required means of egress for dwelling units or for areas described in Item 2.2.1 of Section G304.1.2 required to be located at or above the design flood elevation, where such temporary stairs and ramps comply with Sections 1009 and 1010.

## SECTION BC G309 TEMPORARY STRUCTURES AND TEMPORARY STORAGE

**G309.1 Temporary structures.** Temporary structures shall be erected for a period of less than 180 days. Temporary structures shall be anchored to prevent flotation, collapse or

NYC lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the base flood. Fully enclosed temporary structures shall have flood openings to allow for the automatic entry and exit of floodwaters.

NYC **G309.2 Temporary storage.** Temporary storage includes storage of goods and materials for a period of fewer than 180 days. Stored materials shall not include hazardous materials.

NYC **G309.3 Floodway encroachment.** Temporary structures and temporary storage in floodways shall meet the requirements of Section G103.5.

### SECTION BC G310 UTILITY AND MISCELLANEOUS GROUP U BUILDINGS AND OTHER SIMILAR STRUCTURES

NYC **G310.1 Utility and miscellaneous Group U buildings and other similar structures.** Section G310 shall govern utility and miscellaneous Group U buildings that are identified in Section 312 and other similar structures, including, but not limited to, agricultural buildings, aircraft hangars (accessory to a one- or two-family residence), barns, grain silos (accessory to a residential occupancy), greenhouses, livestock shelters, sheds, stables, and towers.

NYC **G310.2 Flood loads.** Utility and miscellaneous Group U buildings and similar structures, including substantial improvement of such buildings and structures, shall be anchored to prevent flotation, collapse or lateral movement resulting from flood loads, including the effects of buoyancy, during conditions of the design flood.

NYC **G310.3 Elevation.** Utility and miscellaneous Group U buildings and similar structures, including substantial improvement of such buildings and structures, shall be elevated such that the lowest floor, including basement, is at or above the design flood elevation specified in ASCE 24.

NYC **G310.4 Enclosures below design flood elevation.** Fully enclosed areas below the design flood elevation shall comply with Section G304.

NYC **G310.5 Flood-damage-resistant materials.** Flood-damage-resistant materials shall be used below the design flood elevation.

NYC **G310.6 Protection of mechanical, plumbing and electrical systems.** Mechanical, plumbing and electrical systems, including plumbing fixtures, shall be elevated to or above the design flood elevation.

NYC **Exception:** The following shall be permitted to be located below the design flood elevation provided that they are designed and installed to prevent water from entering or accumulating within the components and to resist hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation in compliance with the flood-resistant construction requirements of this code:

1. Electrical systems, equipment and components;
2. Heating, ventilating, air conditioning, and plumbing appliances;
3. Plumbing fixtures;

4. Duct systems; and
5. Other service equipment.

Electrical wiring systems shall be permitted to be located below the design flood elevation provided they conform to the provisions of the *New York City Electrical Code*.

### SECTION BC G311 RETROACTIVE REQUIREMENTS

**G311.1 General.** Notwithstanding any other provision of the *New York City Construction Codes*, the provisions of this section shall apply retroactively to all buildings and structures specified herein.

**G311.2 Connections for temporary external generators.** The following buildings shall be provided with connections for temporary external generators in accordance with Sections G304.5.1 through G304.5.4, as applicable, by January 1, 2033, and a report detailing compliance with such requirements shall be filed with the department in accordance with Section G311.2.2 by such date:

1. Buildings whose main use or dominant occupancy is Group I-1 and that are located in an area of special flood hazard;
2. Buildings whose main use or dominant occupancy is an adult home, enriched housing, community residence or intermediate care facility that is classified as occupancy Group R pursuant to an exception to Section 308.2.1 or 308.2.2 and that are located in an area of special flood hazard;
3. Buildings whose main use or dominant occupancy is Group I-2 hospital and that are located in an area of special flood hazard or shaded X-Zone;
4. Buildings whose main use or dominant occupancy is Group I-2 nursing home and that are located in an area of special flood hazard; and
5. Buildings whose main use or dominant occupancy is Group I-2, other than hospitals and nursing homes, and that are located in an area of special flood hazard.

**G311.2.1 Modification to the area of special flood hazard or shaded X-Zone.** Where the area of special flood hazard or shaded X-Zone is modified on or after the effective date of this section, any building identified in Section† G311.2 and newly identified as being within such modified area of special flood hazard or shaded X-Zone shall, no later than 20 years following the adoption of such modification, comply with the retroactive requirements of Section G311.2. The owner of such building shall, no later than 20 years following the adoption of such modification, file with the department a report detailing compliance with such requirements in accordance with Section† G311.2.2.

**G311.2.2 Report of compliance.** The owner of a building required to comply with the provisions of Section G311.2 shall file with the department, by January 1, 2033, a report prepared by a registered design professional or licensed master electrician (i) certifying that the requirements of Section G311.2 have been satisfied and detailing how such

requirements were satisfied or (ii) certifying that the building met or was altered to meet the provisions of any applicable exception in Sections G304.5.1 or G304.5.2.

**G311.2.3 Filing.** The department may promulgate rules establishing filing fees for the review and examination of such reports.

**G311.3 Connections for temporary external boilers and chillers.** Buildings whose main use or dominant occupancy is Group I-2 hospital that are located in an area of special flood hazard or shaded X-Zone shall be provided with connections for temporary external boilers and chillers in accordance with Section G304.5.2 by January 1, 2033, and a report detailing compliance with such requirements shall be filed with the department in accordance with Section G311.3.2 by such date.

**G311.3.1 Modification to the area of special flood hazard or shaded X-Zone.** Where the area of special flood hazard or shaded X-Zone is modified on or after the effective date of this section, any building whose main use or dominant occupancy is Group I-2 hospital and that is newly identified as being within such modified area of special flood hazard or shaded X-Zone shall comply with the retroactive requirements of Section G311.3 no later than 20 years following the adoption of such modification. The owner of such building shall file with the department a report detailing compliance with such requirements in accordance with section G311.3.2 no later than 20 years following the adoption of such modification.

**G311.3.2 Report of compliance.** The owner of a building required to comply with the provisions of Section G311.3 shall file with the department, by January 1, 2033, a report prepared by a registered design professional (i) certifying that the requirements of Section G311.3 have been satisfied and detailing how much requirements were satisfied or (ii) certifying that any boiler and chiller plants that serve the spaces specified in Item 2 of Section G304.5.2 are located at or above the design flood elevation specified in Table 7-1 of ASCE 24.

**G311.3.3 Filing.** The department may promulgate rules establishing filing fees for the review and examination of such reports.

## CHAPTER G4 REFERENCED STANDARDS

### SECTION BC G401 GENERAL

**G401.1 General.** This chapter lists the standards that are referenced in various sections of this appendix. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard.

**G401.2 Subsequent additions, modifications or deletions.** Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to these standards in accordance with Section 28-103.19 of the *Administrative Code*.

**G401.3 Applicability.** The application of the referenced standards shall be as specified in Section 102.4.

**G401.4 Reserved.**

**G401.5 Reserved.**

**G401.6 Reserved.**

### SECTION BC G402 STANDARDS

ASCE 7-05	Minimum Design Loads for Buildings and Other Structures	G104.5.2, G201.2, G304.2
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ASCE 24-05*	Flood-Resistant Design and Construction	G103.1, G104.3, G104.5.1, G104.5.2, G105.2, G105.3.1, G201.2, G301.1, G303.2, G304.1.2, G304.2, G305.1, G307.1, G307.2, G307.3, G308.1, G308.3
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\*As modified in Chapter G5.

FEMA FIS 360497	Flood Insurance Study, Community Number 360497, Revised September 5, 2007; Federal Emergency Management Agency	G102.2
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FEMA PFIS 360497	Preliminary Flood Insurance Study, Community Number 360497 Federal Emergency Management Agency	G102.2.1, G102.2.2, G102.3.1.1, G102.3.2.2
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FEMA FIRMs 360497	Flood Insurance Rate Map, Community Number 360497, Panel Numbers 1 through 0457, Revised September 5, 2007; Federal Emergency Management Agency, with the following Letter of Map Revision: Letter of Map Revision effective September 29, 2008, FEMA case # 08-02-0948P, revising FIRM panel 0111.†	G102.2, G102.3, G102.3.1, G102.3.2, G103.3, G201.2
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FEMA FIRMs 360497	Preliminary Flood Insurance Rate Map, Community Number 360497, Federal Emergency Management Agency	G102.2.1, G102.2.2, G102.3.1.1, G102.3.2.1
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**Section 1.1.** Section 1.1 (Scope) is amended by deleting Items 1 through 4, and by adding the following paragraph to read as follows:

The scope of this standard is as provided for in Section G102.1 of the *New York City Building Code*, Appendix G.

**Section 1.1.2.** A new Section 1.1.2 is added to read as follows:

**1.1.2 High-risk flood hazard areas.** Notwithstanding any other provision in this standard, no special flood hazard in New York City shall be classified as alluvial fan area, flash flood area, mudslide area, ice jam and debris area, erosion-prone area, high-velocity flow area.

**Section 1.2.** Section 1.2 (Definitions) is amended by modifying only the following definitions

**Design flood elevation**—The applicable elevation specified in Table 2-1, 4-1, 5-1, 6-1, or 7-1, depending on the structural occupancy category designated in Table 1-1.

**High-risk flood hazard area**—An area designated as a coastal high hazard area, being those areas identified on the FIRM as a V-Zone or Coastal A-Zone.

**Nonresidential**—As defined in Section G201 of the *New York City Building Code*, Appendix G.

**Residential**—As defined in Section G201 of the *New York City Building Code*, Appendix G.

**Section 1.4.3.** Table 1-1 of Section 1.4.3 (Classification of Structures) is amended to read as follows:

## SECTION BC G501 MODIFICATIONS

**G501.1 Amendments to ASCE 24-05.** The following amendments are hereby made to the applicable sections of ASCE 24-05. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

**Section 1.2.** Section 1.2 (Definitions) is amended by modifying only the following definitions

**Design flood elevation**—The applicable elevation specified in Table 2-1, 4-1, 5-1, 6-1, or 7-1, depending on the structural occupancy category designated in Table 1-1.

**High-risk flood hazard area**—An area designated as a coastal high hazard area, being those areas identified on the FIRM as a V-Zone or Coastal A-Zone.

**Nonresidential**—As defined in Section G201 of the *New York City Building Code*, Appendix G.

**Residential**—As defined in Section G201 of the *New York City Building Code*, Appendix G.

**Section 1.4.3.** Table 1-1 of Section 1.4.3 (Classification of Structures) is amended to read as follows:



**TABLE 1-1**  
**CLASSIFICATION OF STRUCTURES FOR FLOOD-RESISTANT DESIGN AND CONSTRUCTION**  
**(CLASSIFICATION SAME AS NEW YORK CITY BUILDING CODE TABLE 1604.5)**

STRUCTURAL OCCUPANCY/CATEGORY	NATURE OF OCCUPANCY
<b>I</b>	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: <ol style="list-style-type: none"> <li>1. Agricultural facilities.</li> <li>2. Certain temporary facilities.</li> <li>3. Minor storage facilities.</li> </ol>
<b>II</b>	Buildings and other structures except those listed in Structural $\ddagger$ Occupancy Categories I, III and IV
<b>III</b>	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: <ol style="list-style-type: none"> <li>1. Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.</li> <li>2. Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than 250.</li> <li>3. Buildings and other structures containing adult education facilities, such as colleges and universities with an occupant load greater than 500.</li> <li>4. Group I-2 occupancies with an occupant load of 50 or more resident patients but not having surgery or emergency treatment facilities.</li> <li>5. Group I-3 occupancies.</li> <li>6. Any other occupancy with an occupant load greater than 5,000<sup>a</sup>.</li> <li>7. Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Structural<math>\ddagger</math> Occupancy Category IV.</li> <li>8. Buildings and other structures not included in Structural<math>\ddagger</math> Occupancy Category IV containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.</li> </ol>
<b>IV</b>	Buildings and other structures designated as essential facilities, including but not limited to: <ol style="list-style-type: none"> <li>1. Group I-2 occupancies having surgery or emergency treatment facilities.</li> <li>2. Fire, rescue, ambulance and police stations and emergency vehicle garages.</li> <li>3. Designated earthquake, hurricane or other emergency shelters.</li> <li>4. Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.</li> <li>5. Power-generating stations and other public utility facilities required as emergency backup facilities for Structural<math>\ddagger</math> Occupancy Category IV structures.</li> <li>6. Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.1(2).</li> <li>7. Aviation control towers, air traffic control centers and emergency aircraft hangars.</li> <li>8. Buildings and other structures having critical national defense functions.</li> <li>9. Water storage facilities and pump structures required to maintain water pressure for fire suppression.</li> </ol>

a. For purposes of occupant load calculation, occupancies required by Table 1004.1.1 to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

**Section 2.3.** Table 2-1 of Section 2.3 (Elevation Requirements) is amended to read as follows:

**TABLE 2-1**  
**MINIMUM ELEVATION OF THE TOP OF LOWEST FLOOR**  
**RELATIVE TO DESIGN FLOOD ELEVATION (DFE)—A-ZONES<sup>a</sup>**

STRUCTURAL OCCUPANCY CATEGORY <sup>b</sup>	MINIMUM ELEVATION OF LOWEST FLOOR
I	DFE = BFE
II (1- and 2-family dwellings)	DFE = BFE + 2 ft
II <sup>c, d</sup> (all others)	DFE = BFE + 1 ft
III <sup>c, d</sup>	DFE = BFE + 1 ft
IV <sup>c, d</sup>	DFE = BFE + 2 ft

- Minimum elevations shown in Table 2-1 do not apply to V Zones (see Table 4-1). Minimum elevations shown in Table 2-1 apply to A-Zones unless specific elevation requirements are given in Section 3 of this standard.
- See Table 1-1 or Table 1604.5 of the *New York City Building Code*, for structural occupancy category descriptions.
- For nonresidential buildings and nonresidential portions of mixed-use buildings, the lowest floor shall be allowed below the minimum elevation if the structure meets the floodproofing requirements of Section 6.
- Buildings that include I-2 occupancies that are hospitals shall use the greater of (i) the DFE for the applicable structural occupancy category as indicated in this table or (ii) the 500-year flood elevation.

**Section 4.4.** Table 4-1 of Section 4.4 (Elevation Requirements) is amended to read as follows:

**TABLE 4-1**  
**MINIMUM ELEVATION OF BOTTOM OF LOWEST**  
**SUPPORTING HORIZONTAL STRUCTURAL MEMBER OF**  
**LOWEST FLOOR RELATIVE TO DESIGN FLOOD ELEVATION**  
**(DFE)—V-ZONES AND COASTAL A-ZONES**

STRUCTURAL OCCUPANCY CATEGORY <sup>a</sup>	MEMBER ORIENTATION RELATIVE TO THE DIRECTION OF WAVE APPROACH	
	Parallel <sup>b</sup>	Perpendicular <sup>b</sup>
I	DFE = BFE	DFE = BFE
II (1- and 2-family dwellings)	DFE = BFE + 2 ft	DFE = BFE + 2 ft
II <sup>c</sup> (all others)	DFE = BFE	DFE = BFE + 1 ft
III <sup>c</sup>	DFE = BFE + 1 ft	DFE = BFE + 2 ft
IV <sup>c</sup>	DFE = BFE + 1 ft	DFE = BFE + 2 ft

- See Table 1-1, or Table 1604.5 of the *New York City Building Code*, for structural occupancy category descriptions.
- Orientation of lowest horizontal structural member relative to the general direction of wave approach; parallel shall mean less than or equal to +20 degrees from the direction of approach; perpendicular shall mean greater than +20 degrees from the direction of approach.
- Buildings that include I-2 occupancies that are hospitals shall use the greater of (i) the DFE for the applicable structural occupancy category as indicated in this table or (ii) the 500-year flood elevation.

**Section 4.6.1.** Section 4.6.1 (Breakaway Walls) is amended by adding the following sentence:

All breakaway walls enclosing spaces below the DFE in V-Zones shall be open lattice, and not solid, with such enclosed spaces constructed as unconditioned per the *New York State Energy Conservation Construction Code*.

**Section 5.1.** Table 5-1 of Section 5.1 (Materials, General) is amended to read as follows:

**TABLE 5-1**  
**MINIMUM ELEVATION, RELATIVE TO DESIGN FLOOD**  
**ELEVATION (DFE), BELOW WHICH FLOOD-DAMAGE-RESISTANT**  
**MATERIALS SHALL BE USED**

STRUCTURAL OCCUPANCY CATEGORY <sup>a</sup>	A-ZONE	Coastal High Hazard Areas and Coastal A-Zones	
		Orientation Parallel <sup>b</sup>	Orientation Perpendicular <sup>b</sup>
I	DFE = BFE	DFE = BFE	DFE = BFE
II (1- and 2-family dwellings)	DFE = BFE + 2 ft	DFE = BFE + 2 ft	DFE = BFE + 2 ft
II <sup>c</sup> (all others)	DFE = BFE + 1 ft	DFE = BFE + 1 ft	DFE = BFE + 2 ft
III <sup>c</sup>	DFE = BFE + 1 ft	DFE = BFE + 2 ft	DFE = BFE + 3 ft
IV <sup>c</sup>	DFE = BFE + 2 ft	DFE = BFE + 2 ft	DFE = BFE + 3 ft

- See Table 1-1, or Table 1604.5 of the *New York City Building Code*, for structural occupancy category descriptions.
- Orientation of lowest horizontal structural member relative to the general direction of wave approach; parallel shall mean less than or equal to +20 degrees from the direction of approach; perpendicular shall mean greater than +20 degrees from the direction of approach.
- Buildings that include I-2 occupancies that are hospitals shall use the greater of (i) the DFE for the applicable structural occupancy category as indicated in this table or (ii) the 500-year flood elevation.

**Section 5.2.6.** Section 5.2.6 (Finishes) shall be amended to read as follows:

**5.2.6 Finishes and other materials.** Interior and exterior finishes, as well as any materials not otherwise provided for in Sections 5.2.1 through 5.2.5, shall be flood damage-resistant materials in accordance with FEMA Technical Bulletin 2/August 2008, Flood Damage-Resistant Materials Requirement for Buildings Located in Special Flood Hazard Areas, or shall be required to be approved by the authority having jurisdiction.

**Section 6.2.** Table 6-1 of Section 6.2 (Dry Floodproofing) is amended to read as follows:

**TABLE 6-1**  
**MINIMUM ELEVATION OF FLOODPROOFING, RELATIVE TO**  
**DESIGN FLOOD ELEVATION (DFE)—A-ZONES**

STRUCTURAL OCCUPANCY CATEGORY <sup>a</sup>	MINIMUM ELEVATION OF FLOODPROOFING <sup>b</sup>
I	DFE = BFE + 1 ft
II <sup>c, d</sup>	DFE = BFE + 1 ft
III <sup>d</sup>	DFE = BFE + 1 ft
IV <sup>d</sup>	DFE = BFE + 2 ft

- See Table 1-1, or Table 1604.5 of the *New York City Building Code*, for structural occupancy category descriptions.
- Wet or dry floodproofing shall extend to the same level.
- Dry floodproofing of residential buildings and residential portions of mixed use buildings shall not be permitted.
- Buildings that include I-2 occupancies that are hospitals shall use the greater of (i) the DFE for the applicable structural occupancy category as indicated in this table or (ii) the 500-year flood elevation.

**Section 6.2.2.** Item 3 of Section 6.2.2 (Dry Floodproofing Requirements) is amended to read as follows:

3. Have either:

- 3.1.  $\nexists$  All required means of egress elevated to or above the applicable DFE specified in Table 6-1, capable of providing human ingress and egress during the design flood; or
- 3.2.  $\nexists$  At least one elevated door located in close proximity to each required means of egress to the exterior that is to be blocked by flood shields or flood control devices, such that the face of the elevated door itself, and not merely its directional signage, is clearly visible to a person approaching the blocked egress door(s). Such door(s) shall be elevated to at or above the applicable DFE specified in Table 6-1, capable of providing human ingress and egress during the design flood. Such door(s) shall meet all *New York City Building Code* requirements for a required means of egress to the exterior of the structure including hardware and signage, but shall not be required to comply with the occupant load calculations, unless the structure is intended for occupancy during the design flood. Such door may be accessed by open steps and shall not be required to comply with Chapter 11 of the *New York City Building Code* if its only purpose is to provide supplemental egress and ingress during conditions of flooding and to provide emergency egress at other times.

**Section 6.2.3.** Section 6.2.3 (Limits on Human Intervention) is amended to read as follows:

**Section 6.2.3 Limits on human intervention.** Dry floodproofing measures that require human intervention to activate or implement prior to or during a flood, including temporary stairs or ramps, shall be permitted only when all of the following conditions are satisfied:

1. The flood warning time (alerting potential flood victims of pending flood situation) shall be a minimum of 12 hours, unless the community operates a flood warning system and implements an emergency plan to ensure safe evacuation of flood hazard areas, in which

case human intervention is allowed only if the community can provide a minimum flood warning time equal to or longer than the cumulative;

- (a) time to notify person(s) responsible for installation of floodproofing measures, plus
- (b) time for responsible persons to travel to structure to be floodproofed, plus
- (c) time to install, activate, or implement floodproofing measures, plus
- (d) time to evacuate all occupants from the flood hazard area;
2. All removable shields or covers for openings such as windows, doors, and other openings in walls and temporary stairs or ramps shall be designed to resist flood loads specified in Section 1.6; and
3. Where removable shields or temporary stairs or ramps are to be used, a flood emergency plan shall be approved by the authority having jurisdiction and shall specify, at a minimum, the following information: storage location(s) of the shields and temporary stairs and ramps; the method of installation and removal; conditions activating installation and removal; maintenance of shields and attachment devices and temporary stairs and ramps; periodic practice of installing and removing shields and temporary stairs and ramps; testing sump pumps and other drainage measures; and inspecting necessary material and equipment to activate or implement floodproofing. The flood emergency plan shall be permanently posted in at least two conspicuous locations within the structure.

**Section 7.1.** Table 7-1 of Section 7.1 (General) is amended to read as follows (see Table 7-1 below):

**Section 7.2.4.** Section 7.2.4 (Disconnect Switches and Circuit Breakers) is amended to read as follows:

**7.2.4 Disconnect switches and circuit breakers.** The main disconnect switch, all service disconnecting means, and all circuit breakers shall be located above and be accessible from the elevation specified in Table 7-1. Switches, all service disconnecting means, and circuit

**TABLE 7-1**  
**MINIMUM ELEVATION OF UTILITIES AND ATTENDANT EQUIPMENT RELATIVE TO DESIGN FLOOD ELEVATION (DFE)**

STRUCTURAL OCCUPANCY CATEGORY <sup>a</sup>	LOCATE UTILITIES AND ATTENDANT EQUIPMENT ABOVE <sup>b</sup>		
	A-Zones	Coastal High Hazard Area and Coastal A-Zones	
		Orientation Parallel <sup>c</sup>	Orientation Perpendicular <sup>c</sup>
I	DFE=BFE	DFE=BFE	DFE=BFE
II (1- and 2-family dwellings)	DFE=BFE+ 2 ft	DFE=BFE+ 2 ft	DFE=BFE+ 2 ft
II <sup>c, d</sup> (all others)	DFE=BFE+ 1 ft	DFE=BFE+ 1 ft	DFE=BFE+ 2 ft
III <sup>d</sup>	DFE=BFE+ 1 ft	DFE=BFE+ 2 ft	DFE=BFE+ 3 ft
IV <sup>d</sup>	DFE=BFE+ 2 ft	DFE=BFE+ 2 ft	DFE=BFE+ 3 ft

a. See Table 1-1, or Table 1604.5 of the *New York City Building Code*, for structural occupancy category descriptions.

b. Locate utilities and attendant equipment above elevations shown unless otherwise provided in the text.

c. Orientation of lowest horizontal structural member relative to the general direction of wave approach; parallel shall mean less than or equal to +20 degrees from the direction of approach; perpendicular shall mean greater than +20 degrees from the direction of approach.

d. Buildings that include I-2 occupancies that are hospitals shall use the greater of (i) the DFE for the applicable structural occupancy category as indicated in this table or (ii) the 500-year flood elevation.

breakers shall be located no more than 6 feet 7 inches (2 m) above the floor, or a platform shall be installed to provide access.

**Section 7.3.3.** Section 7.3.3 is amended to read as follows:

**7.3.3 Plumbing Systems Installed Below Minimum Elevations.** Plumbing systems and components, including plumbing fixtures, shall be elevated above the elevation specified in Table 7-1. Where plumbing systems and components have openings below the elevation specified in Table 7-1, the openings shall be protected with automatic backwater valves or other automatic backflow devices. Devices shall be installed in each line that extends below the DFE to prevent release of sewage into floodwaters and to prevent infiltration by floodwaters into the plumbing. Redundant devices requiring human intervention shall be permitted. Plumbing systems shall be provided with backwater valves in the building drain at its point of exit from the building and downstream of the building trap.

**Section 7.3.4.** Section 7.3.4 is amended to read as follows:

**7.3.4 Sanitary systems.** Sanitary systems shall be designed to minimize infiltration of flood waters into the systems and discharges from the systems into floodwaters. Vents and openings shall be above the elevation specified in Table 7-1. Sanitary system storage tanks shall be designed, constructed, installed, and anchored to resist at least 1.5 times the potential buoyant and other flood forces acting on an empty tank during design flood conditions. Tanks and piping shall be installed to resist local scour and erosion. Sanitary systems shall be provided with backwater valves at the point of exit from the building and downstream of the building trap. Sanitary systems that must remain operational during or immediately after the design flood or lesser floods shall be equipped with a sealed storage tank that is sized to store at least 150% of the anticipated sewage flow associated with occupancy during flood conditions and during subsequent periods of saturated soil when sewage will not percolate.

**Section 7.5.1.** A new section 7.5.1 is added to read as follows:

**7.5.1 Elevator signage.** Where there is potential for an elevator cab to descend below the elevation specified in Table 7-1 into a wet floodproofed space, the elevator shall be equipped with controls that will prevent the cab from descending into floodwaters. Permanent, durable, and washable signage shall be placed in the elevator cab and in the elevator lobby on any story subject to flooding, stating that “In the event of flooding, water sensors in the elevator shaft will prevent the elevator from descending to [description of story, e.g., ground floor, first floor, parking level, etc.] and will automatically cause the elevator to rise to [description of story, e.g., second floor, mezzanine, etc.]”

**Section 9.3.1.** The second sentence of the first paragraph of Section 9.3.1 (Attached Garages and Carports) is amended to read as follows:

Wet floodproofed garages and carports are permitted below elevations specified in Table 2-1 provided the low-

est level of the garage or carport is at or above grade on at least one side, the garage or carport walls meet the opening requirements of Section 2.6, and the lowest level of the garage or carport is not classified as a “lowest floor” pursuant to Appendix G of the *New York City Building Code*.

**Section 9.5.** Section 9.5 (Pools) is amended by adding a new paragraph to read as follows:

Mechanical equipment for pools such as pumps and water heaters, and associated electrical wiring, shall comply with Section 7.2 and 7.4.

**G501.2 Reserved.**

**G501.3 Reserved.**

**SECTION BC G601  
RESERVED**

**SECTION BC G701  
RESERVED**

**SECTION BC G702  
RESERVED**





## APPENDIX H

# OUTDOOR SIGNS

NYC  
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### SECTION BC H101 GENERAL

**NYC H101.1 General.** An outdoor sign shall not be erected in a manner that would confuse or obstruct the view of or interfere with exit signs required by Chapter 10 of this code or with official traffic signs, signals or devices. Signs and sign support structures, together with their supports, braces, guys and anchors, shall be kept in repair and in proper state of preservation. The display surfaces of signs shall be kept neatly painted or posted at all times. No sign shall project beyond the street line except as permitted by Chapter 32 of this code.

**NYC H101.2 Signs exempt from permits.** The signs specified in Section 28-105.4.5 of the *Administrative Code* are exempt from the requirements to obtain a permit before erection. ➞ The changing of moveable parts of an approved sign that is designed for such changes, or the repainting or repositioning of display matter shall not be deemed an alteration requiring a separate permit.

### SECTION BC H102 DEFINITIONS

**H102.1 General.** Unless otherwise expressly stated, the following words and terms shall, for the purposes of this appendix, have the meanings shown herein. Refer to Chapter 2 of this code for general definitions.

**COMBINATION SIGN.** A sign incorporating any combination of the features of pole, projecting and roof signs.

**DISPLAY SIGN.** The area made available by the sign structure for the purpose of displaying the sign.

➞ **NYC FILM SIGN.‡** A flat section of a material that is extremely thin in comparison to its length and breadth and has a nominal maximum thickness of 0.01 inch (0.25 mm).

**GROUND SIGN.** A billboard or similar type of sign which is supported by one or more uprights, poles or braces in or upon the ground other than a combination sign or pole sign, as defined by this code.

**POLE SIGN.** A sign wholly supported by a sign structure in the ground.

➞ **PROJECTING SIGN.** A sign other than a wall sign, which projects from and is supported by a wall of a building or structure.

**ROOF SIGN.** A sign erected upon or above a roof or parapet of a building or structure.

**SIGN.** Any letter, figure, character, mark, plane, point, marquee sign, design, poster, pictorial, picture, stroke, stripe, line, trademark, reading matter or illuminated service, which shall be constructed, placed, attached, painted, erected, fastened or manufactured in any manner whatsoever, so that the

same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine or merchandise, whatsoever, which is displayed in any manner outdoors. Every sign shall be classified and conform to the requirements of that classification as set forth in this chapter.

**SIGN STRUCTURE.** Any structure which supports or is capable of supporting a sign as defined in this code. A sign structure is permitted to be a single pole and is not required to be an integral part of the building.

**TEMPORARY SIGN.** A sign, with display area 500 square feet (46.5 m<sup>2</sup>) or less, erected for a period of 30 days or less.

**WALL SIGN.** Any sign attached to or erected against the wall of a building or structure, projecting no more than 15 inches (381 mm) from the face of the wall, with the exposed face of the sign in a plane parallel to the plane of said wall.

### SECTION BC H103 LOCATION

**H103.1 Location restrictions.** Signs shall not be erected, constructed or maintained so as to obstruct any fire escape or any window or door or opening used as a means of egress or so as to prevent free passage from one part of a roof to any other part thereof. A sign shall not be attached in any form, shape or manner to a fire escape or exterior stair, nor be placed in such manner as to interfere with any opening required for natural light or natural ventilation.

**H103.2 Fire Department access.** Signs erected to cover doors or windows required by Section 501.3.2 for Fire Department access to existing buildings shall be provided with access panels to such openings.

### SECTION BC H104 IDENTIFICATION

**H104.1 Identification.** Every outdoor advertising display sign hereafter erected, constructed or maintained, for which a permit is required, shall be marked and identified in accordance with Section 28-502.5 of the *Administrative Code* and as required elsewhere in this appendix.

### SECTION BC H105 DESIGN AND CONSTRUCTION

**H105.1 General requirements.** Signs shall be designed and constructed to comply with the provisions of this code for use of materials, loads and stresses.

**H105.2 Permits, drawings and specifications.** Where a permit is required, as provided in Chapter 1, construction documents shall be required. These documents shall show the dimensions, material and required details of construction,

including loads, stresses and anchors. It is the responsibility of the property owner to have every sign for which a permit is required inspected at least once every calendar year.

**H105.3 Wind load.** Signs shall be designed and constructed to withstand wind pressure as provided for in Chapter 16 of this code.

**H105.4 Seismic load.** Signs shall be designed to meet seismic requirements of Chapter 16 of this code.

**H105.5 Working stresses.** In outdoor advertising display signs, the allowable working stresses shall conform to the requirements of Chapter 16 of this code. The working stresses of wire rope and its fastenings shall not exceed 25 percent of the ultimate strength of the rope or fasteners.

#### Exceptions:

1. The allowable working stresses for steel and wood shall be in accordance with the provisions of Chapters 22 and 23 of this code.
2. The working strength of chains, cables, guys or steel rods shall not exceed one-fifth of the ultimate strength of such chains, cables, guys or steel.

**H105.6 Attachment.** Signs attached to masonry, concrete or steel shall be safely and securely fastened by means of metal anchors, bolts or approved expansion screws of sufficient size and anchorage to safely support the loads applied.

### SECTION BC H106 ELECTRICAL

**H106.1 Illumination.** A sign shall not be illuminated by other than electrical means, and electrical devices and wiring shall be installed in accordance with the requirements of the *New York City Electrical Code*. Any open spark or flame shall not be used for display purposes unless specifically approved.

**H106.1.1 Internally illuminated signs.** Wiring for electric lighting shall be entirely enclosed in the sign cabinet with a clearance of not less than 2 inches (51 mm) from the facing material.

**H106.2 Electrical service.** Signs that require electrical service shall comply with the *New York City Electrical Code*.

**H106.3 Material limitations.** All sign structures for signs requiring electric service shall be constructed of noncombustible materials, except as permitted by Section H107.

**H106.4 Projecting reflectors.** Lighting reflectors may project beyond the top or face of all signs provided that every part of such reflector is at least 10 feet (3048 mm) above the ground or sidewalk level. Reflectors shall be constructed, attached, and maintained so that they shall not be, or become, a hazard to the public.

### SECTION BC H107 MATERIAL LIMITATIONS

**H107.1 Use of combustibles.** In all signs required to be constructed of noncombustible materials pursuant to the provisions of Sections H109 through H116, the following

materials may be used for moldings, cappings, nailing blocks, letters and latticing, or other purely ornamental features of signs, unless otherwise directed by the commissioner: wood, approved plastic or plastic veneer panels as provided for in Chapter 26 of this code, or other materials of combustible characteristics similar to wood.

In all signs permitted to be constructed of combustible materials pursuant to the provisions of Sections H107 through H116, wood and other materials of combustible characteristics similar to wood shall be permitted, pursuant to the provisions of Sections H109 through H116, on the display surface without limit, except that approved plastic shall be limited in area by the provisions of Section H107.1.3.

**H107.1.1 Approved plastic materials.** Plastic materials which burn at a rate no faster than 2.5 inches per minute (64 mm/s) when tested in accordance with ASTM D 635 shall be deemed approved plastics and can be used as the display surface material and for the letters, decorations and facings on signs, subject to the area limitations of Sections H107.1.2 through H107.1.3.

**Exception:** Flexible vinyl signs shall comply with the requirements of Section H114.

**H107.1.2 Plastic area limitations for internally illuminated signs.** Except as provided for in Sections 402.14 and 2611 of this code, approved plastic used on the display surface of internally illuminated signs shall be permitted up to 200 square feet (18.6 m<sup>2</sup>) in area on signs required to be of noncombustible construction and on signs permitted to be of combustible construction.

**H107.1.3 Plastic area limitations for all other signs.** Approved plastic used on the display surface of ground signs, walls signs, roof signs, projecting signs, and marquee signs shall be limited in area as provided by Sections H107.1.3.1 through H107.1.3.4.

**H107.1.3.1 Plastic area limitations on noncombustible ground signs and wall signs.** On ground signs and wall signs required to be constructed of noncombustible materials, if the display surface does not exceed 150 square feet (13.9 m<sup>2</sup>), the entire display surface shall be permitted to be covered by approved plastic. If the area of a display surface exceeds 150 square feet (13.9 m<sup>2</sup>), the area occupied or covered by approved plastics shall be limited to 150 square feet (13.9 m<sup>2</sup>) plus 50 percent of the difference between 150 square feet (13.9 m<sup>2</sup>) and the total area of display surface. The area of plastic on a display surface shall not in any case exceed 1,050 square feet (97.5 m<sup>2</sup>), unless approved by the commissioner.

**H107.1.3.2 Plastic area limitations on combustible ground signs and wall signs.** On ground signs and wall signs permitted to be constructed of combustible materials, if the display surface does not exceed 300 square feet (27.9 m<sup>2</sup>), 50 percent of the display surface shall be permitted to be covered by approved plastic. If the area of a display surface exceeds 300 square feet (27.9 m<sup>2</sup>), the area occupied or covered by approved plastics shall be limited to 150 square feet (13.9 m<sup>2</sup>) plus 25 percent of the difference between 150 square

feet (13.9 m<sup>2</sup>) and the total area of display surface. The area of plastic on a display surface shall not in any case exceed 575 square feet (53.4 m<sup>2</sup>), unless approved by the commissioner.

#### **H107.1.3.3 Plastic area limitations on noncombustible roof signs, projecting signs, and marquee signs.**

On roof signs, projecting signs, and marquee signs required to be constructed of noncombustible materials, if the display surface does not exceed 150 square feet (13.9 m<sup>2</sup>), the entire display surface shall be permitted to be covered by approved plastic. If the area of a display surface exceeds 150 square feet (13.9 m<sup>2</sup>), the area occupied or covered by approved plastics shall be limited to 150 square feet (13.9 m<sup>2</sup>) plus 25 percent of the difference between 150 square feet (13.9 m<sup>2</sup>) and the total area of display surface. The area of plastic on a display surface shall not in any case exceed 575 square feet (53.4 m<sup>2</sup>), unless approved by the commissioner.

**H107.1.3.4 Plastic area limitations on combustible roof signs.** On roof signs permitted to be constructed of combustible materials, if the display surface does not exceed 1,000 square feet (92.9 m<sup>2</sup>), 25 percent of the display surface shall be permitted to be covered by approved plastic. If the area of a display surface exceeds 1,000 square feet (92.9 m<sup>2</sup>), the area occupied or covered by approved plastics shall be limited to 250 square feet (23.2 m<sup>2</sup>) plus 10 percent of the difference between 250 square feet (23.2 m<sup>2</sup>) and the total area of display surface. The area of plastic on a display surface shall not in any case exceed 350 square feet (32.5 m<sup>2</sup>), unless approved by the commissioner.

**H107.2 Glass panels.** Glass panels used in display areas of signs shall be designed in accordance with Chapter 24 of this code.

### **SECTION BC H108 ANIMATED DEVICES**

**H108.1 Fail-safe device.** Signs that contain moving sections or ornaments shall have fail-safe provisions to prevent the section or ornament from releasing and falling or shifting its center of gravity more than 15 inches (381 mm). The fail-safe device shall be in addition to the mechanism and the mechanism's housing which operate the movable section or ornament. The fail-safe device shall be capable of supporting the full dead weight of the section or ornament when the moving mechanism releases.

### **SECTION BC H109 GROUND SIGNS**

**H109.1 Materials.** Ground signs erected inside the fire districts shall be constructed entirely of noncombustible materials and the facings of such signs shall be of noncombustible materials, except as permitted by Section H107. Outside the fire districts, the structure of ground signs exceeding 25 feet (7620 mm) in height above grade or exceeding 2500 square feet (232 m<sup>2</sup>) in display area shall be constructed of noncom-

bustible materials, and the facing of such signs shall be noncombustible, except as permitted by Section H107.

**H109.2 Required clearance.** The bottom coping of every ground sign shall be not less than 3 feet (914 mm) above the ground or street level, which space can be filled with platform decorative trim or light wooden construction.

**H109.3 Wood anchors and supports.** Where wood anchors or supports are embedded in the soil, the wood shall be pressure treated with an approved preservative.

### **SECTION BC H110 ROOF SIGNS**

**H110.1 Materials.** Roof signs erected inside the fire districts shall be constructed entirely of noncombustible materials and the facings of such signs shall be of noncombustible materials, except as permitted by Section H107. Outside of the fire districts, the structure of roof signs exceeding 65 feet (19 812 mm) in height above grade, or exceeding 1500 square feet (139 m<sup>2</sup>) in display area, shall be constructed of noncombustible materials and the facings of such signs shall be of noncombustible materials, except as permitted by Section H107.

**H110.2 Required clearance.** Roof signs shall be constructed so as to provide a clear space of at least 7 feet (2134 mm) between the roof and the lowest part of the sign and at least 5 feet (1524 mm) between the vertical supports thereof.

**H110.3 Location.** Roof signs shall be set back a minimum of 6 feet (1829 mm) from the face of the walls of the building on which they are erected.

**H110.4 Bearing plates.** The bearing plates of roof signs shall distribute the load directly to or upon masonry walls, steel roof girders, columns or beams. The building shall be designed to avoid overstress of these members.

**H110.5 Reserved.**

### **SECTION BC H111 WALL SIGNS**

**H111.1 Materials.** Wall signs erected inside the fire districts shall be constructed entirely of noncombustible materials, and the facings of such signs shall be of noncombustible materials, except as permitted by Section H107. Outside of the fire districts, the structure of wall signs exceeding 500 square feet (46 m<sup>2</sup>) in display area shall be constructed of noncombustible materials, and the facings of such signs shall be of noncombustible materials, except as permitted in Section H107.

**H111.2 Exterior wall mounting details.** Wall signs attached to exterior walls of solid masonry, concrete or stone shall be safely and securely attached by means of metal anchors, bolts or expansion screws of not less than <sup>3</sup>/<sub>8</sub> inch (9.5 mm) diameter and shall be embedded at least 5 inches (127 mm). Wood blocks shall not be used for anchorage, except in the case of wall signs attached to buildings with walls of wood. A wall sign shall not be supported by anchorages secured to an unbraced parapet wall.



**H111.3 Extension.** Wall signs shall not extend above the top of the wall, nor beyond the ends of the wall to which the signs are attached unless such signs conform to the requirements for roof signs, projecting signs or ground signs.

## SECTION BC H112 PROJECTING SIGNS

**H112.1 Materials.** Projecting signs shall be constructed entirely of noncombustible materials, and the facings of such signs shall be of noncombustible materials, except as permitted by Section H107.

**H112.2 Attachment.** Projecting signs shall be securely attached to a building or structure by metal supports such as bolts, anchors, chains, guys or steel rods. Supports shall be secured to a bolt or expansion screw that will develop the strength of the supporting chains, guys or steel rods, with a minimum  $\frac{5}{8}$ -inch (15.9 mm) bolt or lag screw, by an expansion shield. Turn buckles shall be placed in chains, guys or steel rods supporting projecting signs. Staples or nails shall not be used to secure any projecting sign to any building or structure. The dead load of projecting signs not parallel to the building or structure and the load due to wind pressure shall be supported with chains, guys or steel rods having net cross-sectional dimension of not less than  $\frac{3}{8}$ -inch (9.5 mm) diameter. Such supports shall be erected or maintained at an angle of at least 45 degrees (0.78 rad) from the horizontal to resist the dead load and at angle of 45 degrees (0.78 rad) or more with the face of the sign to resist the specified wind pressure. If such projecting sign exceeds 30 square feet (2.8 m<sup>2</sup>) in one facial area, there shall be provided at least two such supports on each side not more than 8 feet (2438 mm) apart to resist the wind pressure.

**H112.3 Wall mounting details.** Chains, cables, guys or steel rods used to support the live or dead load of projecting signs are permitted to be fastened to solid masonry walls with expansion bolts or by machine screws in iron supports, but such supports shall not be attached to an unbraced parapet wall. Where the supports must be fastened to walls made of wood, the supporting anchor bolts must go through the wall and be plated or fastened on the inside in a secure manner.

**H112.4 Height limitation.** A projecting sign shall not be erected on the wall of any building so as to project above the roof or cornice wall or above the roof level where there is no cornice wall; except that a sign erected at a right angle to the building, the horizontal width of which sign is perpendicular to such a wall and does not exceed 24 inches (610 mm), is permitted to be erected to a height not exceeding 5 feet (1524 mm) above the roof or cornice wall or above the roof level where there is no cornice wall. A sign attached to a corner of a building and parallel to the vertical line of such corner shall be deemed to be erected at a right angle to the building wall.

**Exception:** On buildings 35 feet (10 668 mm) high or less, projecting signs, not exceeding 24 inches (610 mm) in width, may be erected to a maximum height of 40 feet (12 192 mm) above grade but in no case to a height of more than 15 feet (4572 mm) above the main roof level.

**H112.5 Additional loads.** Projecting sign structures which will be used to support an individual on a ladder or other servicing device, whether or not specifically designed for the servicing device, shall be capable of supporting the anticipated additional load, but not less than a 100-pound (445 N) concentrated horizontal load and a 300-pound (1334 N) concentrated vertical load applied at the point of assumed or most eccentric loading. The building component to which the projecting sign is attached shall also be designed to support the additional loads.

**H112.6 Thickness.** Projecting signs shall be limited in thickness as provided for in Table H112.6.

TABLE H112.6  
THICKNESS OF PROJECTING SIGNS

PROJECTION (feet)	MAXIMUM THICKNESS (feet)
5	2
4	2.5
3	3
2	3.5
1	4

For SI: 1 foot = 304.8 mm.

**H112.7 Location restrictions.** Projecting signs shall not be erected on buildings located on those streets and avenues listed in Section 3202.2.1.8.

## SECTION BC H113 MARQUEE SIGNS

**H113.1 Materials.** Marquee signs shall be constructed entirely of noncombustible materials, and the facings of such signs shall be of noncombustible materials, except as provided for in Section H107.

**H113.2 Attachment.** Marquee signs shall be attached to approved marquees that are constructed in accordance with Section 3106 of this code and shall be anchored in conformance with the requirements for projecting signs under Section H112.

**H113.3 Extension.** No part of a marquee sign shall project above or below the marquee fascia, or beyond the perimeter of the marquee.

**Exception:** On marquees attached to buildings classified as Occupancy Group A-1, skating rinks in Occupancy Group A-4 or amusement park structures in Occupancy Group A-5 marquee signs may project not more than 8 feet (2438 mm) above nor more than 1 foot (305 mm) below the fascia, provided that the total height of such signs does not exceed 9 feet (2743 mm) and the lowest part of such signs is at least 10 feet (3048 mm) above the ground or sidewalk level. Marquee signs shall not project beyond the horizontal ends of the marquee.

**H113.4 Location restrictions.** Marquee signs erected on marquees projecting beyond the street line shall be limited to those occupancy groups and locations provided by Section 3202.2.1.4.5 of this code.

## SECTION BC H114 FLEXIBLE FABRIC SIGNS

**H114.1 General.** The provisions of this section shall apply to flexible fabric signs and flexible fabric sign structures, including the fabric display area, the restraining framework, and all stiffening and fastening devices.

**H114.2 Materials.** Fabric used in flexible fabric signs shall be flame resistant in accordance with NFPA 701 or listed under UL 214.

**H114.2.1 Longevity.** The same fabric shall not be used for longer than a 12-month period. The same fabric may be relocated and re-erected within that 12-month period, but in no case shall re-inking of fabrics be permitted.

**H114.2.2 Affidavit.** Prior to installation of a flexible fabric sign, an affidavit shall be submitted to the Department in which the sign graphic producer shall attest that the sign was made from noncombustible fabric, flame-resistant fabric tested in accordance with NFPA 701 by a nationally recognized testing entity, or fabric bearing a UL classification mark obtained from the manufacturer of the fabric.

**H114.2.3 Identification.** The additional requirements set forth in Sections‡ H114.2.3.1 through H114.2.3.2 shall apply:

**H114.2.3.1 UL classification decal.** All signs shall bear a decal bearing the UL classification mark or name of the testing entity and its listing number, on a corner of the face of the fabric. This decal shall be of color(s) contrasting with those of the background of the display, and shall be readable from street or roadway level with the aid of binoculars.

**H114.2.3.2 Date of sign erection.** All signs shall bear a decal identifying the date of erection of the flexible sign structure on a corner of the face of the sign fabric. This decal shall be of color(s) contrasting with those of the background of the display, and shall be readable from street or roadway level with the aid of binoculars. If the same fabric is relocated, the existing decal shall remain, and a new decal stating the re-erection date shall be affixed.

**H114.2.4 Limitations.** When erected on walls, flexible fabric signs exceeding 500 square feet (46.5 m<sup>2</sup>) in area shall be of the open weave type, unless backed by means of a wall sign or projecting sign structure supported as provided by Sections H111 and H112.

**H114.3 Attachment to exterior walls.** A flexible fabric sign attached to an exterior wall shall be attached in accordance with this section. The sign fabric shall not be placed in front of doors, windows, glass blocks, louvers, grilles, fire escapes, exterior stairs, balconies, marquees, wall recesses or projections unless backed by a wall sign or a projecting sign structure as provided by Sections H111 and H112.

**H114.3.1 Load spreader bars.** Load spreader bars comprised of noncombustible materials must be inserted around the entire perimeter of the fabric display area into pockets that are either woven, or heat-welded and stitched

seamed. The load spreader bars shall be provided with rounded edges to prevent tearing of the fabric.

**H114.3.2 Spring snaps.** As an alternate to load spreader bars, the side hems of the fabric may be equipped with grommets to receive spring snaps. The applicant shall determine the appropriate spacing of grommets. The sides of fabric display areas equipped with grommets may be secured with spring snaps to vertical steel wire rope in lieu of restraining angles. The vertical steel wire rope shall be anchored to the wall or other mounting surface by means of eyebolts spaced at intervals to be determined by the applicant. The ends of the vertical steel wire rope shall be restrained by means of turnbuckles or “J” hooks secured to metal angles.

**H114.3.3 Fasteners.** Fasteners shall consist of “J” hooks secured with lock nuts or double nuts to continuous metal restraining angles around the perimeter of the display area. The “J” hooks shall extend through holes in the load spreader bars. The ends of the “J” hooks shall be secured with either safety clips or nuts in order to prevent accidental dislodging of the load spreader bars. In lieu of “J” hooks and restraining angles, the load spreader bars in the pockets along the top edge of the fabric display area may be bolted to steel flat bars.

**H114.3.3.1 Metal restraining angles and bars.** For all flexible sign structures, the metal angles and/or steel flat bars shall be secured to the wall or other mounting surface. Angles and/or bars shall not be secured to any parapet or wall unless the applicant has determined that the parapet or wall is capable of resisting the loads imposed on it by the flexible sign structure. Unsatisfactory parapets or walls shall be braced or otherwise reinforced as determined by the applicant, prior to the erection of the flexible sign structure. A wall sign, projecting sign, roof sign or ground sign structure must be capable of resisting the loads imposed on it by the flexible sign structure.

**H114.3.4 Tensioning.** Initial tension may be applied mechanically to the fabric display area, but it shall be held in final position by adjusting or tightening the turnbuckles, or the nuts holding the “J” hooks to the restraining angles. Mechanical tensioning devices may not remain attached to the flexible sign, except as permitted by Section H114.4.

**H114.4 Attachment to sign structures.** Fabric stretched around any edge of a sign structure shall be protected from any sharp edge that may cut or tear the fabric. The perimeter of the fabric located on the front or rear of a sign structure shall be secured as required by Section H114.3, except that the “J” hooks may be secured directly to the sign structure.

**H114.4.1 Tensioning devices.** Opposing ends of a fabric sign stretched around the edges of a sign structure may be secured to each other by means of mechanical tensioning devices behind the sign structure, provided that the open ends for the “S” hooks shall be closed with safety clips. Spring snaps may be used in lieu of “S” hooks. The mechanical tensioning devices shall be fastened to safety wires, placed through the holes in the load spreader bars

**H114.4.2 Limitations.** The length of the fabric or safety wire perpendicular to any edge of the sign structure shall be dimensioned such that in the event of failure of any part of the flexible sign structure, no load spreader bars, mechanical tensioning devices, clamps, or wires will strike any nearby doors, windows, vents, chimneys, grilles, skylights, light fixtures, decorations or other wall appurtenances, or mechanical equipment, nor shall any load spreader bar fall within 10 feet (3048 mm) of grade.

**H115.1 General.** Portable signs shall conform to requirements for ground, roof, projecting, flat and temporary signs where such signs are used in a similar capacity. The requirements of this section shall not be construed to require portable signs to have connections to surfaces, tie-downs or foundations where provisions are made by temporary means or configuration of the structure to provide stability for the expected duration of the installation.

[illegible]

1. When permitted by the Department of Transportation, temporary signs of combustible materials may be suspended from buildings or poles to extend across streets.
2. Temporary signs of combustible materials constructed without a frame may be attached flat against, or suspended from, the fascia of a canopy or marquee, provided that the lowest part of any such sign is at least 9 feet (2743 mm) above the ground or sidewalk level.

ASTM D 635-10	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position	H107.1.1	NYC
NFPA 70 1-04	Methods of Fire Test for Flame Propagation of Textiles and Films	H114.2	NYC
UL 214-01	Standard for Tests for Flame Propagation of Fabrics and Films	H114.2	NYC

# APPENDIX I RESERVED







# APPENDIX J RESERVED





## APPENDIX K

# MODIFIED INDUSTRY STANDARDS FOR ELEVATORS AND CONVEYING SYSTEMS

### CHAPTER K1

#### MODIFICATIONS TO ASME A17.1 - 2000, *SAFETY CODE FOR ELEVATORS AND ESCALATORS*, WITH SUPPLEMENTS A17.1a – 2002 AND A17.1b - 2003

**K101.1 General.** As referenced by Chapter 30 of the *New York City Building Code*, the provisions of ASME A17.1-00 with supplements A17.1a-02 and A17.1b-03 shall be modified in accordance with this chapter. The section numbers correlate to those in the referenced ASME standard. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*. This appendix incorporates and supersedes modifications to such standard made by 1 RCNY 3610-01 and 1 RCNY 3610-02.

### PART 1 GENERAL

#### SECTION 1.3 DEFINITIONS

##### 1.3 Add or delete and revise the following definitions to Section 1.3 as follows:

Delete and revise the definition “Designated level” to read as follows:

**DESIGNATED LEVEL.** For the purpose of applying Section 2.27.3, designated level shall mean the street floor or other level that best serves the needs of emergency personnel for fire fighting or rescue purposes.

Add new definition “Elevator classification” to read as follows:

**ELEVATOR CLASSIFICATION.** Elevator is classified as freight or passenger.

Delete and revise the definition “Hospital emergency service” to read as follows:

**HOSPITAL EMERGENCY SERVICE.** A special operating control function that may be provided for elevators in Occupancy Group I-2 (Hospital) or other applicable medical facility used to transport a patient in a life or death situation.

Add new definition “Patient elevator” to read as follows:

**PATIENT ELEVATOR.** An elevator located in a building classified in Occupancy Group I-2 (Hospital) reserved for the “sole” use of vertical transportation of nonambulatory patients who are incapable of self-preservation because of age, physical or mental disability. Hospital staff or other passengers transporting a patient are permitted to ride with the patient. Such elevators must be oper-

ated by a designated attendant and shall meet the requirements of Sections 2.27.4 and 2.27.5.3.

Add new definition “Sky lobby” to read as follows:

**SKY LOBBY.** The lowest landing of an elevator or a group of elevators located above the street level.

Add new definition “Smoke hole” to read as follows:

**SMOKE HOLE.** An opening for venting at the top of the elevator hoistway(s).

Add new definition “Zero clearance vestibule” to read as follows:

**ZERO CLEARANCE VESTIBULE.** A limited space on the elevator lobby between the exterior of the hoistway door and the security door attached to the elevator hoistway.

### PART 2 ELECTRIC ELEVATORS

#### SECTION 2.1 CONSTRUCTION OF HOISTWAYS AND HOISTWAY ENCLOSURES

##### 2.1.4 Control of smoke and hot gases.

Delete Section 2.1.4.

##### 2.1.6 Projections, recesses and setbacks in hoistway enclosures.

Delete and revise Section 2.1.6.2 to read as follows:

**2.1.6.2** On sides not used for loading and unloading:

- (a) Recesses, except those necessary for installation of elevator equipment, shall not be permitted;
- (b) Beams, floor slabs, or other building construction making an angle less than 75 degrees with the horizontal shall not project more than 50 mm (2 in.) inside the hoistway enclosure unless the top surface of the projection is beveled at an angle not less than 75 degrees with the horizontal;
- (c) Separator beams between adjacent elevators are not required to have bevels;
- (d) Where setbacks exceeding 50 mm (2 in.) occur in the enclosure wall, the top of the setback shall be beveled at an angle of not less than 75 degrees with the horizontal;
- (e) Bevels are not required if the projections and setbacks are covered with material conforming to the following:



- (1) It shall be equal to or stronger than 1.110 mm (0.0437 in.) wire;
- (2) It shall have openings not exceeding 25 mm (1 in.); and
- (3) It shall be supported and braced such that it will not deflect more than 25 mm (1 in.) when subjected to a force of 4.79 kPa (100 lbs. per sq ft) applied horizontally at any point.

## SECTION 2.2 PITS

### 2.2.2 Design and construction of pits.

Delete and revise Section 2.2.2.5 to read as follows:

**2.2.2.5** Elevators with sprinklers in the shaftway shall be provided with a drain or sump pump.

### 2.2.4 Access to pits.

Delete and revise Section 2.2.4.1 to read as follows:

**2.2.4.1** Access shall be by means of the lowest hoistway door or by means of a separate pit access door located at the level of the pit floor.

Add new Subsection (f) to Section 2.2.4.4 to read as follows:

**2.2.4.4** Separate pit door, when provided, shall be subject to the following requirements:

- (f) Pit doors shall be labeled "DANGER, ELEVATOR PIT" with letters not less than 51 mm (2 in.) high.

## SECTION 2.7 MACHINE ROOMS AND MACHINE SPACES

### 2.7.3.4 Access doors and openings.

Add new Subsection (e) to Section 2.7.3.4.1 to read as follows:

**2.7.3.4.1** Access doors to machine rooms and overhead machinery spaces shall:

- (e) Be labeled "ELEVATOR MACHINE ROOM," with letters not less than 51 mm (2 in.) high.

### 2.7.5 Lighting, temperature, and humidity in machine rooms and machinery spaces.

Add new Section 2.7.5.3 to read as follows:

**2.7.5.3** A duplex receptacle rated at not less than 20A, 120V with ground fault circuit interrupter shall be provided in each machine room and machinery space. The receptacle shall not be used for permanently installed equipment.

### 2.7.8 Remote machine and control rooms.

Delete and revise Section 2.7.8.4 to read as follows:

**2.7.8.4** Permanent two-way voice communication shall be provided between the elevator car, elevator machine room,

and/or control room, and the lobby fire command station (where required or provided).

## SECTION 2.8 EQUIPMENT IN HOISTWAYS AND MACHINE ROOMS

### 2.8.1 Electrical equipment and wiring.

Delete and revise Section 2.8.1.2 to read as follows:

**2.8.1.2** Only such electrical wiring, raceways, and cables used directly in connection with the elevator, including wiring for signals, for communication with the car, fire department communications equipment, for lighting, heating, air conditioning, and ventilating the car, for fire detecting systems, for pit sump pumps, and for heating and lighting the hoistway and/or machine room and equipment allowed in Section 2.14.1.9.1(d) shall be permitted to be installed inside the hoistway.

### 2.8.2 Pipes, ducts, tanks, and sprinklers.

Delete and revise Section 2.8.2.3 to read as follows:

**2.8.2.3** Sprinkler systems are not permitted in control/machine rooms.

## SECTION 2.11 PROTECTION OF HOISTWAY OPENINGS

### 2.11.1 Entrances and emergency doors required.

Delete and revise Section 2.11.1.1 to read as follows:

**2.11.1.1** Hoistway landing entrances. All elevator hoistway-landing openings shall be provided with entrances that shall guard the full height and width of the openings. Entrances shall be at least 2030 mm (80 in.) in height and 915 mm (36 in.) in width.

Delete and revise Subsection (a) of 2.11.1.2 to read as follows:

**2.11.1.2** Emergency doors in blind hoistways. Where an elevator is installed in a single blind hoistway, there shall be installed in the blind portion of the hoistway, in line with the car door, an emergency door at every third floor, but not more than 11 m (36 ft) from sill to sill, conforming to the following:

- (a) The clear opening shall be at least 915 mm (36 in.) wide and 2030 mm (80 in.) high.

### 2.11.2 Types of entrances.

Delete and revise Section 2.11.2.1 to read as follows:

**2.11.2.1** Passenger elevators. For passenger elevators, entrances shall be one of the following types:

- (a) Horizontally sliding;
- (b) Horizontally swinging, single-section;
- (c) Hand- or power-operated vertically sliding that slide up to open.

Delete and revise Section 2.11.2.2 to read as follows:

**2.11.2.2** Freight elevators. For freight elevators, entrances shall be one of the following types:

- (a) Horizontally sliding;
- (b) Swinging, single-section;
- (c) Center-opening, two- horizontally swinging, subject to the restrictions of Section 2.11.2.3;
- (d) Vertically sliding biparting counterbalanced (see Section 2.16.4); or
- (e) Vertically sliding counterweighted, single or multisection.

## 2.11.6 Opening of hoistway doors.

### Delete and revise Section 2.11.6.2 to read as follows:

**2.11.6.2** Means shall not be provided for locking out of service the doors at:

- (a) The top terminal landing;
- (b) The bottom terminal landing;
- (c) The designated sky lobby and sky lobby alternate landings for elevators equipped with Phase I Emergency Recall Operation, when Phase I is effective;
- (d) Any landing for elevators equipped with Phase II Emergency In-Car Operation when Phase II is effective;
- (e) Consecutive vacant floors;
- (f) Main lobby street floor.

### Add new Section 2.11.6.5 to read as follows:

#### 2.11.6.5 Mechanical locking of vestibule doors.

- (a) *Zero clearance vestibule.* Elevator landings provided with a zero clearance vestibule, not to exceed 150 mm (6 in.) from the elevator hoistway door, are permissible only when locking devices accessible from the car are installed exclusively on the door that separates the zero clearance vestibule from the occupied floor space.
- (b) *Elevator landing on floors other than designated level provided with a vestibule.* Locking devices at the vestibule will be permitted under any one of the following:
  - (1) A red telephone is installed in the vestibule near the elevator doors in the elevator lobby to communicate with the main lobby fire command station or building manager's office or to central service station when the building is not attended. A sign shall be posted near the telephone. The sign shall read **"In Case of Fire or Other Emergency, Use This Phone to Contact Lobby or Building Manager or Central Service Station"**.
  - (2) The locking devices on the vestibule door leading to an exit are released upon the activation of any detection or signaling devices or power failure and are approved as failsafe meeting the requirements of Chapter 9 of the *New York City Building Code*.

- (3) At least one exit stair is located within the vestibule.

## 2.11.7 Glass in hoistway doors.

### Delete and revise Sections 2.11.7.1, 2.11.7.1.1 and 2.11.7.1.2 and add a new Section 2.11.7.1.2.1 to Section 2.11.7.1.2 to read as follows:

**2.11.7.1 Vision panels.** Manually operated or self-closing hoistway doors of the vertically or horizontally sliding type, for elevators with automatic or continuous-pressure operation, shall be provided with a vision panel. In multi doors, the vision panel is required in one only, but is permitted to be placed in all sections. All horizontally swinging elevator doors shall be provided with vision panels. Vision panels are permitted for any type of hoistway door. Vision panels shall not be required at the landing of automatic operation elevators equipped with horizontally side sliding car and hoistway doors.

Where required or used, vision panels shall conform to Sections 2.11.7.1.1 through 2.11.7.1.7.

**2.11.7.1.1** The area of any single vision panel shall not be less than 0.008 m<sup>2</sup> (12 in<sup>2</sup>), and the total area of one or more panels in any hoistway door shall not be more than 0.026 m<sup>2</sup> (40 in<sup>2</sup>).

**2.11.7.1.2** Each clear panel opening shall reject a ball 102 mm (4 in.) in diameter.

**2.11.7.1.2.1** Hoistway door vision panels must be protected by protective grills made of number sixteen (16) gauge stainless or galvanized steel in accordance with the following specifications:

- (a) Grills shall be sized to fit within or over the vision panel frame and completely cover the vision panel opening in the elevator, car doors and hoistway doors.
- (b) Grills and vision panel frames shall be secured by means of non-reversible screws or other tamper proof fasteners.
- (c) Grills shall contain openings that shall not be larger than 19 mm (0.75 in.) in diameter.
- (d) All cut edges shall be deburred.
- (e) Requirements for such grills may be waived if certification is submitted that such elevator is operated manually or twenty four (24) hour doorman service is provided. A security guard shall not be considered doorman service.
- (f) For the purpose of this section, 6 mm (0.25 in.) thick, listed wire glass on shaftwall side of assembly, 6 mm (0.25 in.) listed wire glass in middle, and 6 mm (0.25 in.) thick polycarbonate on hallway side only, may be used in lieu of the metal protective.

## 2.11.11 Entrances, horizontal slide type.

### Delete and revise Subsection (a) of Section 2.11.11.6 to read as follows:

**2.11.11.6 Bottom guides.** Bottom guides shall conform to the following:

- (a) The bottom of each panel shall be guided by two or more members.

**Delete and revise the heading of Section 2.12 to read as follows:**

**SECTION 2.12  
HOISTWAY-DOOR LOCKING DEVICES AND  
HOISTWAY ACCESS SWITCHES AND  
ELEVATOR PARKING DEVICES**

**2.12.3 Hoistway-door combination mechanical locks and electric contacts.**

**Delete Section 2.12.3 in its entirety.**

**2.12.4 Listing/certification door locking devices and door or gate electric contacts.**

**Delete and revise Section 2.12.4.1 to read as follows:**

**2.12.4.1 Type tests.** Each type and make of hoistway-door interlock, and car door or gate electric contact shall be of an approved type.

**Add new Section 2.12.6.2.6 to read as follows:**

**2.12.6.2.6 Elevator parking device.**

(a) *Parking devices required.* Elevators that are operated from within the car only and have manual operated doors that can be opened with a common tool shall have elevator-parking devices installed at that landing. This device shall be located at a height not greater than 2.11 m (6 ft 11 in.) above the floor. Parking devices are not required for elevators having hoistway doors that are automatically unlocked when the car is within the landing zone.

(b) *General design requirements.* Parking devices shall conform to the following requirements:

- (1) They shall be mechanically or electrically operated.
- (2) They shall be designed and installed so that friction or sticking or the breaking of any springs used in the device will not permit opening or unlocking a door when the car is outside the landing zone of that floor.
- (3) Springs, where used, shall be of the restrained compression type, to prevent separation of the parts in case the spring breaks.

(c) *Car interior lighting.* The car interior lighting shall not be extinguished and must meet the requirements of 3.4.5 of ASME A17.3 as modified by Chapter K3 of this appendix.

**Delete and revise Section 2.12.7.3.2 to read as follows:**

**2.12.7.3.2** The car cannot be operated at a speed greater than 0.35 m/s (75 ft/min).

**Delete and revise Section 2.13.2.1.2 to read as follows:**

**2.13.2.1.2** Collapsible car gates shall not be power opened.

**SECTION 2.14  
CAR ENCLOSURES, CAR DOORS  
AND GATES AND CAR ILLUMINATION**

**2.14.2 Passenger-car enclosures.**

**Delete and revise Section 2.14.2.1.1 to read as follows:**

**2.14.2.1.1** Materials in their end use configuration, other than those covered by Sections 2.14.2.1.2 through 2.14.2.1.6, shall conform to the following requirements, based on the tests conducted in accordance with the requirements of ASTM E 84, UL 723, or NFPA 255:

- (a) Flame spread rating of 0 to 50.
- (b) Smoke development of 0 to 100.

**Delete and revise Subsections (a) and (b) of Section 2.14.2.5 to read as follows:**

**2.14.2.5 Vision panels.** Vision panels are not required, but where used, shall:

- (a) Be of a total area of not more than 0.047 m<sup>2</sup> (72 in<sup>2</sup>), and contain no single glass panel having a width exceeding 101 mm (4 in.);
- (b) Hoistway door vision panels must be protected by protective grills made of number sixteen (16) gauge stainless or galvanized steel in accordance with the following specifications:
  - (1) Grills shall be sized to fit within or over the vision panel frame and completely cover the vision panel opening in the elevator, car doors and hoistway doors.
  - (2) Grills and vision panel frames shall be secured by means of non-reversible screws or other tamper proof fasteners.
  - (3) Grills shall contain openings that shall not be larger than 19 mm (0.75 in.) in diameter.
  - (4) All cut edges shall be deburred.
  - (5) Requirements for such grills may be waived if certification is submitted that such elevator is operated manually or twenty-four (24) hour doorman service is provided. A security guard shall not be considered doorman service.
  - (6) For the purpose of this subsection (b), a vandal resistant 6 mm (0.25 in.) polycarbonate sheet, such as Lexan, in two (2) layers, one (1) on each side of the required wire glass, may be used in lieu of the metal protective.

**2.14.4 Passenger and freight car doors and gates, general requirements.**

**Delete and revise Section 2.14.4.11 to read as follows:**

**2.14.4.11 Closed position of car doors or gates.** Car doors or gates shall be considered to be in the closed position under the following conditions:

- (1) For horizontally sliding doors or gates, when the clear open space between the leading edge of the door or gate and the nearest face of the jamb does not exceed 25 mm (1 in.) except where car doors are provided with a car-door interlock(s), 10 mm (0.375 in.);
- (2) For vertically sliding counterweighted doors or gates, when the clear open space between the leading edge of the door or gate and the car platform sill does not exceed 25 mm (1 in.); and
- (3) For horizontally sliding center-opening doors, or vertically sliding biparting counterbalanced doors, when the door panels are within 25 mm (1 in.) of contact with each other, except where horizontally sliding center opening car doors are provided with a car door interlock(s), 10 mm (0.375 in.).

## **2.14.7 Illumination of car and lighting fixtures.**

**Delete and revise Section 2.14.7.1.4 to read as follows:**

**2.14.7.1.4** Each elevator shall be provided with a guarded electric light and convenience outlet fixture on the car top and under the car platform.

## **SECTION 2.15 CAR FRAMES AND PLATFORMS**

### **2.15.8 Protection of platforms against fire.**

**Delete and revise Section 2.15.8 to read as follows:**

**2.15.8 Protection of platforms against fire.** All platform materials exposed to the hoistway shall be either:

- (a) Metal; or
- (b) Other materials that, in their end use configuration, conform to the following requirements, based on the tests conducted in accordance with the requirements of ASTM E 84, UL 723 or NFPA 255:
  - (1) Flame spread rating of 0 to 50; and
  - (2) Smoke development of 0 to 100.

## **SECTION 2.16 CAPACITY AND LOADING**

### **2.16.1 Minimum rated load for passenger elevators.**

**Add new Section 2.16.1.3.3 to read as follows:**

**2.16.1.3.3** Nonpermanent freight-handling equipment (Section 2.14.1.9.1) shall be removed when the elevator is used for passenger service.

## **SECTION 2.20 SUSPENSION ROPES AND THEIR CONNECTIONS**

### **2.20.9 Suspension rope fastening.**

**Add new text to Section 2.20.9.5 to read as follows:**

**2.20.9.5 Wedge rope sockets.** Wedge socket assemblies shall be of a design as shown in Fig. 2.20.9.5, and shall conform to Sections 2.20.9.2 and 2.20.9.3, and Sections 2.20.9.5.1 through 2.20.9.5.6. Wedge rope sockets are not permitted on counterweighted winding drum machines.

## **SECTION 2.21 COUNTERWEIGHTS**

### **2.21.1 General requirements.**

**Delete and revise Section 2.21.1.2 to read as follows:**

**2.21.1.2 Retention of weight sections.** Means shall be provided to retain weights in place in the event of buffer engagement or safety application or if they become broken. Where tie rods are used, a minimum of two (2) shall be provided and they shall pass through all weight sections. Tie rods shall be provided with a lock nut and a cotter pin at each end. Counterweight material shall be steel, iron or lead only and shall have a minimum melting temperature of 620°F (327°C).

### **2.21.4 Compensation means.**

**Delete and revise Section 2.21.4 to read as follows:**

**2.21.4 Compensation means.** Except for safety hooks, where used, compensation means, such as compensating ropes or chains or other mechanical means and their attachments used to tie the counterweight and car together, shall be capable of withstanding, with a factor of safety of five (5), any forces to which the means is subjected with the elevator at rest. The maximum suspended weight of compensation means with car or counterweight at the top of its travel and one half-total weight of tension sheave assembly, where used, shall be included. The factor of safety for compensation means shall be based on the proof load, breaking strength, or test reports.

## **SECTION 2.22 BUFFERS AND BUMPERS**

### **2.22.4 Oil buffers.**

**Add new Subsections (a) and (b) to Section 2.22.4.6 to read as follows:**

**2.22.4.6 Means for determining oil level.** Oil buffers shall be provided with means for determining that the oil level is within the maximum and minimum allowable limits. Glass sight gauges shall not be used.

- (a) A fixed inclined ladder shall be provided where the top of the buffer cylinder is over 1524 mm (5 ft) in height above the pit floor.
- (b) A fixed vertical or inclined ladder fitted with an inspection and maintenance platform with guard rails shall be provided where the top of the car buffer cylinder is over 2134 mm (7 ft) from the pit floor.



## SECTION 2.24 DRIVING MACHINES AND SHEAVES

### 2.24.10 Means for inspection of gears.

Delete and revise Section 2.24.10 to read as follows:

**2.24.10 Means for inspection of gears.** Each gear case of geared machines shall have access to permit inspection of the contact surfaces of the gears.

## SECTION 2.25 TERMINAL STOPPING DEVICES

### 2.25.3 Final terminal-stopping devices.

Add new Subsection (d) to Section 2.25.3.1 to read as follows:

**2.25.3.1 General requirements.** Final terminal-stopping devices shall conform to Section 2.25.1 and the following:

- (d) Final limit switches and bracket shall be permanently secured and pinned.

## SECTION 2.26 OPERATING DEVICES AND CONTROL EQUIPMENT

### 2.26.1.4 Inspection operation.

Add new Items 3 and 4 to Section 2.26.1.4.1, Subsection (c) to read as follows:

#### 2.26.1.4.1 General requirements.

- (c) Inspection operating devices shall:
  - (1) Be of the continuous-pressure type;
  - (2) Be labeled “UP” and “DOWN,” respectively;
  - (3) A separate device of the continuous-pressure type labeled “ENABLE” shall be provided adjacent to the inspection operating devices; and
  - (4) The inspection operating devices shall become effective only when the “ENABLE” device is activated.

Delete and revise Section 2.26.1.4.2 to read as follows:

**2.26.1.4.2 Top-of-car inspection operation.** Top-of-car inspection operation shall conform to Section 2.26.1.4.1 and the following:

- (a) A stop switch (see Section 2.26.2.8) shall be permanently located on the car top and readily accessible to a person standing at the hoistway entrance normally used for access to the car top.
- (b) The transfer switch (see Section 2.26.1.4.1(b)) shall be located on the car top and shall be so designed as to prevent accidental transfer from the “INSPECTION” to “NORMAL” position.

- (c) The inspection operating devices (see Section 2.26.1.4.1(c)) shall be permitted to be of the portable type provided that:

- (1) the “ENABLE” device (see Section 2.26.1.4.2(c)), and a stop switch, in addition to the stop switch required in Section 2.26.1.4.2(a) are included in the portable unit; and
- (2) the flexible cord is permanently attached so that the portable unit cannot be detached from the car top.

- (d) Separate additional devices of the continuous-pressure type shall be permitted to be provided on the car top to make power door opening and closing and automatic car-leveling operative from the top of the car for testing purposes.

### 2.26.2 Electrical protective devices:

Delete and revise Section 2.26.2.5 to read as follows:

**2.26.2.5 Emergency stop switch.** On all elevators, an emergency stop switch shall be provided in the car, and located in or adjacent to each car operating panel. When open (“STOP” position), this switch shall cause the electric power to be removed from the elevator driving-machine motor and brake. Emergency stop switches shall:

- (a) Be of the manually opened and closed type;
- (b) Have red operating handles or buttons;
- (c) Be conspicuously and permanently marked “STOP,” and shall indicate the “STOP” and “RUN” positions; and
- (d) While opened, cause the audible device to sound (see Section 2.27.1.1.1).

Delete Section 2.26.2.21 in its entirety.

### 2.26.5 System to monitor and prevent automatic operation of the elevator with faulty door contact circuits.

Add the following exception to Section 2.26.5(b)(2):

**Exception:** When operating on Firefighters’ Service Phase II, item (b)(2) shall not be permitted.

## SECTION 2.27 EMERGENCY OPERATION AND SIGNALING DEVICES

### 2.27.1 Car Emergency signaling devices.

Add new text to Section 2.27.1.1.1 as follows:

**2.27.1.1.1** A two-way communications means between the car and a location in the building that is readily accessible to authorized and emergency personnel shall be provided. Means shall be provided to enable two-way voice communication between the machine room and the interior of the car.

Delete and revise Section 2.27.2.4.3 to read as follows:

**2.27.2.4.3** Means shall be provided adjacent to the selector switch (es) to indicate that the elevator is at the designated level with the doors in the normally open position.

**2.27.3 Firefighters' emergency operation—automatic elevators.**

**Delete and revise Sections 2.27.3.1.1, 2.27.3.1.2 and 2.27.3.1.3 to read as follows:**

**2.27.3.1.1** A two-position key-operated switch shall be:

- (a) Provided at the designated level for each single elevator or for each group of elevators;
- (b) Labeled "FIRE RECALL" and its positions marked "NORMAL" and "FIREMAN SERVICE" (in that order). The "FIRE RECALL" letters shall be a minimum of 5 mm (0.25 in.) high in red or a color contrasting with a red background;
- (c) Located in the lobby within sight of the elevator or all elevators in that group and shall be readily accessible.

**2.27.3.1.2** An additional key-operated "FIRE RECALL" switch, with two (2) positions, marked "NORMAL" and "FIREMAN SERVICE" (in that order), shall be permitted at the building fire control station.

**2.27.3.1.3** The switch(es)† shall be rotated clockwise to go from "NORMAL" to "FIREMAN SERVICE" positions. Keys shall be removable in the "NORMAL" and "FIREMAN SERVICE" positions.

**Delete and revise Section 2.27.3.1.5 to read as follows:**

**2.27.3.1.5** All "FIRE RECALL" switches shall be provided with an illuminated visual signal (see Fig. 2.27.3.1.6(h), to indicate when Phase I Emergency Recall Operation is in effect.

**Delete and revise Section 2.27.3.2 to read as follows:**

**2.27.3.2 Phase I fire alarm activation.**

**2.27.3.2.1 Smoke detectors.** Except as set forth in subsection k of this section, smoke detectors installed in accordance with subsections a, b, c or d shall initiate Phase I emergency recall operation.

- (a) In buildings where a fire command station is not required or provided, a single smoke detector shall be installed in the ceiling of each elevator landing over the call button on each floor.
- (b) In buildings where a fire command station is required or provided, either of the following shall apply:
  - (1) An analog addressable smoke detector employing alarm verification shall be installed in the ceiling of each elevator landing over the call button on each floor, or
  - (2) Two (2) smoke detectors for cross zoning shall be installed in the ceiling of each ele-

vator landing on each floor and spaced as follows:

- (i) In an elevator landing containing one (1) or two (2) elevators, the distance between smoke detectors shall be the width of the hoistway(s) but not greater than 3048 mm (10 ft).
- (ii) In an elevator landing containing three (3) or more elevators, the distance between smoke detectors shall be the distance between the centerlines of the end elevators but not greater than 6096 mm (20 ft).

(c) Associated Elevators:

- (1) In associated elevator machine rooms of the buildings described in subsection (a) above, a smoke detector shall be installed.
- (2) In associated elevator machine rooms of the buildings described in subsection (b) above, either of the following shall be installed:
  - (i) An analog addressable smoke detector employing alarm verification; or
  - (ii) At least two (2) smoke detectors for cross zoning spaced 6096 mm (20 ft) apart but not closer to the hoistway enclosure walls one-fourth ( $\frac{1}{4}$ ) distance of the width of the machine room.

(d) A smoke detector shall be installed at the top of the hoistway(s) in Occupancy Group R-2 where a fire alarm system is installed or required. Smoke detectors may be installed in any other hoistway and shall be installed in hoistways that are sprinklered.

(e) Smoke detectors are not required in elevator landings at an unenclosed landing which is open to the outside air.

(f) Smoke detector:

- (1) In buildings described in subsection (a) above, where a single smoke detector is installed in the elevator landing, the activation of a smoke detector in any elevator landing, other than the sky lobby, shall cause all automatic elevators servicing the floor on which the sensing device is activated to return nonstop to the designated or sky lobby level, except as modified by the commissioner.
- (2) In buildings described in subsection (b) above, where either an analog addressable smoke detector or two (2) smoke detectors for cross zoning are installed, the activation of either an analog addressable smoke detector or any one of the two smoke detectors for cross zoning in any elevator

lobby shall annunciate at the fire command station only with floor identification. After verification of an alarm condition either from the analog addressable smoke detector or from the first detector of cross zoning detectors, the completion of the delayed time period of an analog addressable smoke detector or the activation of both smoke detectors for cross zoning in any elevator lobby, other than the sky lobby, shall cause all automatic elevators servicing the floor on which the sensing device is activated to return nonstop to the designated or sky lobby level, except as modified by the commissioner.

- (3) In associated machine rooms described in Item 1 of subsection (c) above, the activation of the smoke detector in the elevator machine room shall cause all automatic elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to return nonstop to the designated or sky lobby level, except as modified by the commissioner.
- (4) In associated machine rooms described in Item 2 of subsection (c) above, where either an analog addressable smoke detector or two (2) smoke detectors for cross zoning are installed, the activation of either an analog addressable smoke detector or any one of the two smoke detectors for cross zoning in any elevator machine room shall annunciate at the fire command station only with floor identification. After verification of an alarm condition either from the analog addressable smoke detector or from the first detector of cross zoning detectors, the completion of the delayed time period of an analog addressable smoke detector or the activation of both smoke detectors for cross zoning in any elevator machine room shall cause all automatic elevators having any equipment located in that machine room, and any associated elevators of a group automatic operation, to return nonstop to the designated or sky lobby level, except as modified by the commissioner.
- (5) In addition to the activation of mechanical ventilation if provided (Section 2.1.4), the activation of a smoke detector in any elevator hoistway shall cause all automatic elevators having any equipment located in the hoistway and any associated elevators of a group automatic operation, to return nonstop to the designated or sky lobby level. The operation of this subsection shall con-

form to the requirements of Section 2.27.3.1.

- (g) When the lowest landing of elevators is above the designated level, such as the sky lobby level, the activation of smoke detectors in the sky lobby level or the activation of the waterflow alarm (Section 2.27.3.2.2) on the sky lobby floor shall cause such elevators to return nonstop to a floor two (2) stories above the sky lobby level or, in the absence of a stop at that floor, to the nearest landing above the sky lobby level.
- (h) Elevators shall react only to the first smoke detector zone that is activated for that group.
- (i) Smoke detectors and/or smoke detector systems shall not be self-resetting.
- (j) Activation of smoke detectors to initiate elevator recall shall override any automatic programming for car stops but shall not affect the other elevator safety circuits.
- (k) The following buildings shall be exempt from the requirements of this section:
  - (1) Buildings where the main use or dominant occupancy is classified in Occupancy Group R-2, except that they shall comply with the requirements of Section 2.27.3.2.1(d).
  - (2) Buildings where the main use or dominant occupancy is classified in Occupancy Group R-3.
  - (3) Existing buildings with occupied floors at or below 22 860 mm (75 ft) above the lowest Fire Department vehicle access level classified in Occupancy Group E that have at least one elevator available at all times for immediate use by the Fire Department and that are in compliance with the Fire Department's regulations governing "life safety requirements for schools with students having physical disabilities."
  - (4) Existing office buildings, one hundred (100) feet or more in height and existing high-rise buildings as defined by the *New York City Building Code* equipped throughout with an automatic sprinkler system including a waterflow alarm.

**2.27.3.2.2 Sprinkler waterflow alarm.** In a building equipped throughout with an automatic sprinkler system, the activation of the waterflow alarm shall cause Phase I emergency recall operation to be initiated (Section 2.27.3.1).

**Delete and revise Section 2.27.3.3 to read as follows:**

**2.27.3.3 Phase II emergency in-car operation.** A three-position ("NORMAL," "HOLD," and "FIREMAN SERVICE" in that order) key-operated switch shall be provided in an operating panel in each car. The switch shall

be rotated clockwise to go from the “NORMAL” to “HOLD” to “FIREMAN SERVICE” position. It shall become effective only when the designated or sky lobby level Phase I switch (Section 2.27.3.1) is in the “FIREMAN SERVICE” position or a smoke detector or water-flow alarm has been activated, and the car has returned to the designated, sky lobby or the level designated by Section 2.27.3.2.1(g) by Phase I operation. The key shall be removable in “NORMAL” or “HOLD” position. The “NORMAL,” “HOLD,” and “FIREMAN SERVICE” positions shall not change the operation until the car is at a landing with the doors in the normal open position.

**2.27.3.3.1** When the Phase II switch is in the “FIREMAN SERVICE” position, the elevator shall be on Phase II operation, and the elevator shall operate as follows:

- (a) The elevator shall be operable only by a designated person in the car.
- (b) All corridor call buttons and directional lanterns shall remain inoperative. Car position indicators, where provided, shall remain in service. Hall position indicators, where provided, shall remain inoperative except at the designated level, sky lobby level and the fire control station, where they shall remain in service for Fire Department operations.
- (c) Only a continuous pressure door open button shall control the opening of power-operated doors. If the button is released prior to the door reaching the normal open position, the doors shall automatically close. Section 2.13.3.3, Section 2.13.4.2.1(b)(2), and Section 2.13.4.2.1(c) do not apply. On cars with two entrances, separate door-open buttons shall be provided for each entrance if both entrances can be opened at the same landing.
- (d) Open power-operated doors shall be closed only by momentary pressure on the door close button. On cars with two entrances, a separate door-close button shall be provided for each entrance if both entrances can be opened at the same landing.
- (e) Opening and closing of power operated car doors or gates that are opposite manual swing or manual slide hoistway doors shall conform to the requirements of Section 2.27.3.3.1(c) and (d). Door opening and closing buttons shall be provided in the car-operating panel.
- (f) Door reopening devices rendered inoperative, per Section 2.27.3.1.6(e) shall remain inoperative. Full speed closing is permitted. Corridor door opening and closing buttons, if provided, shall be rendered inoperative.
- (g) Every car shall be provided with a button marked “CALL CANCEL” located in the same car operating panel as the Phase II switch, which shall be effective during Phase

II operation. When activated, all registered calls shall be canceled and a traveling car shall stop at or before the next available landing.

- (h) Floor selection buttons shall be provided in the car to permit travel to all landings served by the car and they shall be operative at all times. Means that prevent the operation of the floor selection buttons or door operating buttons shall be rendered inoperative.
- (i) A traveling car shall stop at the next available landing for which a car call was registered. When a car stops at a landing, all registered car calls shall be cancelled.
- (j) The emergency stop switch shall remain operative.

**2.27.3.3.2** When the Phase II switch is in the “HOLD” position, the elevator shall be on Phase II operation. The car shall remain at the landing with its doors open. The door close buttons shall be inoperative.

**2.27.3.3.3** When the Phase II switch is in the “NORMAL” position, the elevator is not at the designated or sky lobby level and Phase I is in effect, the elevator shall operate as follows.

- (a) Automatic power-operated horizontally-sliding doors shall close automatically and the car shall revert to Phase I operation (Section 2.27.3.1) upon completion of door closing. All door reopening devices shall remain inoperative. Door open buttons shall remain operative. Full speed closing is permitted. If the Phase II switch is turned to the “FIREMAN SERVICE” or “HOLD” position prior to the completion of door closing, the doors shall reopen.
- (b) Elevators having power operated vertically sliding doors shall have corridor door open and close buttons rendered operative. All door reopening devices shall remain inoperative. Door closing shall be in accordance with the requirements of Section 2.27.3.3.1(d). Full speed closing is permitted. If the Phase II switch is turned to the “FIREMAN SERVICE” or “HOLD” position prior to the completion of door closing, the doors shall reopen. The car shall revert to Phase I operation (Section 2.27.3.1) upon completion of door closing.
- (c) Elevators having manual doors shall revert to Phase I operation (Section 2.27.3.1) upon completion of door closing.

**2.27.3.3.4** When the Phase II switch is in the “NORMAL” position and the car is not at the designated or the sky lobby level, and Phase I is not in effect, the car shall remain at the landing with the doors open and door-close buttons inoperative and shall remain in Phase II.

**2.27.3.3.5** Elevators shall be removed from Phase II operation only when:



- (a) The Phase II switch is in the "NORMAL" position and the car is at the designated or sky lobby level with the doors in the normal open position; or
- (b) The Phase II switch is in the "NORMAL" position when Phase I is in effect at the designated or sky lobby level with the doors in the normal open position.

#### 2.27.3.3.6

- (a) For all elevators, applications filed after March 12, 1991 (the effective date of adoption of Cal #1 1-91-BCR), that propose the installation, alteration or change of controller, elevator machinery and any other work, excluding minor alteration and ordinary repairs, and applications filed for new elevators, the cost of which exceeds \$10,000 per car over twelve-month period, shall comply with the requirements of this subsection.
- (b) In elevators complying with the requirements of subsection (a) above, a three-position switch labeled "NORMAL," "HOLD," and "FIREMAN SERVICE" shall be required to replace the existing two-position switch ("NORMAL" and "FIREMAN SERVICE"). The new "HOLD" position shall be marked by engraving or by affixing a permanent label to the operating panel of the elevator.

#### 2.27.4 Firefighters' emergency operation nonautomatic elevators.

Delete and revise Section 2.27.4.1 to read as follows:

**2.27.4.1 Phase I emergency recall operation.** A two-position key-operated switch shall be provided at the designated or the sky lobby level only for each single elevator or for each group of elevators. The two-position switch shall be "NORMAL" and "FIREMAN SERVICE" (in that order). The commissioner with the concurrence of the fire commissioner may allow an additional two-position key-operated switch marked "NORMAL" and "FIREMAN SERVICE" (in that order) at another location. However, it shall not affect Phase I operation if the designated-level or sky lobby level smoke detector or waterflow alarm has been activated. The switch(es) shall be rotated clockwise to go from the "NORMAL" to "FIREMAN SERVICE" position. All keys shall be removable from any position.

No device, other than Phase I switch(es), smoke detectors in the elevator lobbies, machine room, or hoistway, or a waterflow alarm in lieu of smoke detectors in the elevator lobbies, shall initiate Phase I operation.

When all switches are in the "NORMAL" position, normal elevator service shall be retained and operation from the smoke detectors or waterflow alarm required shall be functional.

When a Phase I switch is in the "FIREMAN SERVICE" position, a visual and audible signal shall be provided to alert the attendant to return nonstop to the designated or sky lobby level. The visual signal shall read

"FIRE RECALL – RETURN TO" {insert level to which the car should be returned (the designated level or sky lobby level)}. The smoke detectors or waterflow alarm shall be activated when Phase I is in effect.

Delete and revise Section 2.27.4.2 to read as follows:

**2.27.4.2 Phase I smoke detectors or waterflow alarm devices activation.** Smoke detectors shall be installed in accordance with the requirements of Section 2.27.3.2 Phase I operation and shall be initiated when either any smoke or waterflow alarms are activated.

- (a) When the lowest landing of elevators is above the designated level, such as the sky lobby level, the activation of smoke detectors or a waterflow alarm in the sky lobby or sky lobby floor shall cause such elevators to return nonstop to a floor two stories above the sky lobby level or in the absence of a stop at that floor, to the nearest landing above the sky lobby level.
- (b) Elevators shall react only to the first smoke detector zone that is activated for that group.
- (c) Smoke detectors and/or smoke detector systems shall not be self-resetting.
- (d) Activation of smoke detectors to initiate elevator recall shall override any automatic programming for car stops but shall not affect the other elevator safety circuits.
- (e) The buildings described in Section 2.27.3.2(1)(k) and meeting its requirements and buildings equipped throughout with an automatic sprinkler system are exempt from the requirements of this section.

#### 2.27.5 Firefighters' emergency operation automatic elevators with designated attendant operation.

Delete and revise Section 2.27.5.2 to read as follows:

**2.27.5.2** When operated by a designated attendant in the car (except hospital emergency service):

- (a) Elevators parked at a floor shall conform to the requirements of Section 2.27.3.1. At the completion of a time delay of not less than fifteen (15) seconds nor more than sixty (60) seconds, elevators shall conform to the requirements of Section 2.27.3. There shall be no delay when the car is at the designated level.
- (b) A moving car shall conform to the requirements of Section 2.27.3.

Add three new Subsections 2.27.5.3.1, 2.27.5.3.2 and 2.27.5.3.3 to read as follows:

**2.27.5.3.1 Hospital emergency service recall operation.** When hospital emergency service is provided, a two-position key-operated corridor call (Hospital Emergency Service) switch shall be provided at one or more landings to activate the special control function by authorized or designated personnel. The two-position switch shall be marked "NORMAL" and "HOSPITAL EMERGENCY SERVICE." Keys shall be removable only in the "NORMAL" position.

When the switch is in the “HOSPITAL EMERGENCY SERVICE” position:

- (1) All patient elevator cars equipped with the special control function shall override normal automatic operating modes for immediate recall of the patient elevator(s) to the landing at which the call is registered.
- (2) On patient elevator cars with two entrances, if both entrances can be opened at the designated level, the doors serving the corridor where the two-position hospital emergency service switch is located shall open and remain open.
- (3) A patient elevator car traveling away from the designated level shall reverse at or before the next available landing without opening its doors.
- (4) A patient elevator car stopped at a landing other than the designated level, with the doors open and in-car emergency stop switch in the run position, shall close the doors without delay and proceed to the designated level.
- (5) A visual and audible signal shall be activated within the patient elevator car to alert the passengers and/or attendant operator that the “hospital emergency service” function has been activated.
- (6) Upon arrival at the registered call landing, power operated doors shall open automatically and remain in the open position for a predetermined adjustable time period to allow the authorized personnel sufficient time to activate the “in-car” special operation function.
- (7) If the Phase I (Section 2.27.3.1) recall mode is initiated while the elevator is under “hospital emergency service” recall mode and “in-car” hospital emergency service is not activated, the elevator shall revert to Phase I (Section 2.27.3.1) operation.
- (8) Hospital emergency service corridor recall shall not override fire emergency Phase I (Section 2.27.3.1) or Phase II (Section 2.27.3.3) operation in effect.

**2.27.5.3.2 Hospital emergency service in-car operation.** A two-position “NORMAL” and “HOSPITAL EMERGENCY SERVICE” key-operated switch shall be provided in an operating panel inside the patient elevator(s) to activate the “hospital emergency service,” a special independent operating mode. The switch shall be rotated clockwise to go from the “NORMAL” to “HOSPITAL EMERGENCY SERVICE” position. It shall become effective only when the designated level corridor call “hospital emergency service” switch is in the “HOSPITAL EMERGENCY SERVICE” position and the car has returned to the designated level by “hospital emergency service” recall operation.

When the “in-car” switch is in the “HOSPITAL EMERGENCY SERVICE” position, the patient elevator shall be on hospital emergency service operation, and the patient elevator shall operate as follows:

- (1) The patient elevator shall be operable only by a designated person in the car.
- (2) Activation of the “in-car” operating mode shall remove the patient elevator from normal automatic and/or attendant service.
- (3) The patient elevator(s) shall not be recalled under Phase I (Section 2.27.3.1) operation after the activation of “in-car” operation mode.
- (4) Doors shall remain open until the authorized person registers the car call and initiates the door closing function.
- (5) The patient elevator shall travel directly to the selected landing, overriding normal corridor call demand or Phase I (Section 2.27.3.1) recall and shall automatically open the doors upon the arrival at the selected landing, except when the smoke detector(s) are activated on the selected landing or the waterflow alarm is activated on that floor. In such case, before the patient elevator has reached the selected landing, the patient elevator shall stop at a floor two stories below the selected landing or in the absence of a stop at that floor, at the nearest landing below the selected landing.
- (6) When the patient elevator reaches the selected floor and the smoke detector(s) are activated on that landing or the waterflow alarm is activated on that floor before the doors are open, the patient elevator, without opening the doors, shall travel to a floor two stories below the selected landing or in the absence of a stop at that floor, to the nearest landing below the selected landing.
- (7) Doors shall remain open with the audible and visual signal functioning until the “in-car” switch is turned to the “NORMAL” position or for a predetermined adjustable time period to allow the removal of patients from the car and the patient elevator is placed into automatic, attendant or Phase I (Section 2.27.3.1) if in effect, operating mode.
- (8) Upon transfer from “HOSPITAL EMERGENCY SERVICE” back to normal operation during a fire emergency and Phase I (Section 2.27.3.1) is in effect, the patient elevator shall be automatically recalled to the designated level.

**2.27.5.3.3 Hospital emergency service switches color.** The color of the Hospital Emergency Service switches located in the corridor at the designated level and inside the patient elevator(s) operating panel shall be blue.

**Delete Section 2.27.7 in its entirety.**

**Delete and revise Section 2.27.8 to read as follows:**

**2.27.8 Switch keys.** The switches required by Section 2.27.2 through Section 2.27.5 for all elevators in a building shall be operable only by a citywide standard key 2642 and the New York City Fire Department standard key. The citywide standard key shall be designed in accordance with the requirements of the Fire Department and shall be obtained only through Fire Department authorization. Citywide standard keys shall be kept on the premises by a person responsible for the maintenance and operation of the elevators in a location readily accessible to authorized persons in an emergency, but not where they are available to the public.

## **SECTION 2.29 IDENTIFICATION**

**Delete and revise Section 2.29.1 to read as follows:**

**2.29.1 Identification of equipment.** Each elevator shall be assigned a unique numerical identification, a minimum of 6 mm (0.25 in.) in height. The identification number shall be applied to the following locations:

- (a) The driving machine;
- (b) MG and/or transformers set;
- (c) Controller;
- (d) Selector;
- (e) Governor;
- (f) Main line disconnect switch;
- (g) The crosshead, or where there is no crosshead, the car frame, such that it is visible from the top of the car;
- (h) The car operating panel, minimum of 13 mm (0.5 in.) in height;
- (i) Adjacent to or on every elevator entrance at the designated level, minimum of 75 mm (3 in.) height; and
- (j) Each bank of elevators shall be identified by an alphabetic letter.

**Add new Section 2.29.1.1 to read as follows:**

**2.29.1.1 New York City identification number.** Each elevator shall be assigned a unique numerical identification, engraved into a metal tag, in block type, with a minimum of 6 mm (0.25 in.) in height, and securely attached in a permanent manner. The city identification number shall be applied to the following locations:

- (a) The driving machine;
- (b) MG and/or Transformers set;
- (c) Controller;
- (d) Main line disconnect switch;
- (e) The crosshead, or where there is no crosshead, the car frame, such that it is visible from the top of the car;
- (f) The car operating panel (main panel only).

## **PART 3 HYDRAULIC ELEVATORS**

### **SECTION 3.7 MACHINE ROOMS AND MACHINERY SPACES**

**Delete and revise first paragraph of Section 3.7 to read as follows:**

Machine rooms and machinery spaces shall conform to Section 2.7.1 through Section 2.7.5 and Section 2.7.7 and shall be vented to the outside air naturally or mechanically.

### **SECTION 3.26 OPERATING DEVICES AND CONTROL EQUIPMENT**

#### **3.26.3 Anticreep and leveling operation.**

**Delete and revise Section 3.26.3.1.2 to read as follows:**

**3.26.3.1.2** The anticreep device shall maintain the car within 13 mm (0.5 in) of the landing irrespective of the position of the hoistway door.

## **PART 4 ELEVATORS WITH OTHER TYPES OF DRIVING MACHINES**

### **SECTION 4.3 HAND ELEVATORS**

**Delete Section 4.3 in its entirety.**

## **PART 5 SPECIAL APPLICATION ELEVATORS**

### **SECTION 5.2 LIMITED-USE/LIMITED-APPLICATION ELEVATORS**

#### **5.2.1 Electric limited-use/limited-application elevators.**

**Delete and revise Section 5.2.1.13 to read as follows:**

**5.2.1.13 Power operation of hoistway doors and car doors.** When provided, power operation, power opening, and power closing of hoistway doors and car doors shall conform to Section 2.13, except as modified by Section 5.2.1.13.

- (a) Requirement of Section 2.13.1(b) is modified as follows: Power-operated swing hoistway doors shall not be permitted.
- (b) Requirement of Section 2.13.2.2.3 does not apply.
- (c) Requirement of Section 2.13.3.4 does not apply.
- (d) Requirement of Section 2.13.6 does not apply.

**Delete and revise Subsection (b) of Section 5.2.1.16.1 to read as follows:**

**5.2.1.16.1 Rate load and platform area.**

- (b) The inside net platform area shall not exceed 1.67 m<sup>2</sup> (18 ft<sup>2</sup>) and in no event shall be less than 1219 mm by 1219 mm (4 ft by 4 ft) with a minimum 812 mm (32 in.) clear door opening. The car operating panel shall be on the strike wall.

## PART 6 ESCALATORS AND MOVING WALKS

### SECTION 6.1 ESCALATORS

#### 6.1.1 Protection of floor openings.

Delete and revise Section 6.1.3.3.5 to read as follows:

**6.1.3.3.5 Clearance between skirt and step.** The clearance on either side of the steps between the step and the adjacent skirt panel shall not be more than 4 mm (0.16 in.), and the sum of the clearances on both sides shall be not more than 7 mm (0.28 in.).

Add new text to Subsection (c) of 6.1.3.3.6 to read as follows:

#### 6.1.3.3.6 Skirt panels.

- (c) The exposed surfaces of the skirt panels adjacent to the steps shall be smooth and made from a low friction material, or permanently treated with a friction-reducing material. Untreated surfaces, such as porcelain, enameled steel bronze, or stainless steel, are not acceptable.

Delete Section 6.1.3.3.7 in its entirety.

Delete and revise Section 6.1.3.3.8 to read as follows:

**6.1.3.3.8 Skirt deflector devices.** Deflector devices shall be required and extend from skirt panels parallel to the escalator path of travel. Means to secure such deflector devices are required to be on the exposed surface of the skirt. Any exposed fastener heads shall be of the tamper-resistant type and flush to within 1 mm (0.04 in.).

Delete and revise Section 6.1.3.5.4 to read as follows:

**6.1.3.5.4 Clearance between step threads.** The maximum clearance between step treads on the horizontal run shall be 6 mm (0.25 in.). (See Appendix I of ASME A17.1a, Fig I7)

Delete and revise Section 6.1.6.3.6 to read as follows:

**6.1.6.3.6 Skirt obstruction device.** Means shall be provided to cause the electric power to be removed from the escalator driving machine motor and brake, if an object becomes caught between the step and the skirt as the step approaches the upper combplate, intermediate device or lower comb plate. On units having a run of 6096 mm (20 ft) or more, intermediate devices shall be provided on both sides of the escalator with devices located at intervals of 3048 mm (10 ft) or less. The activation of an intermediate device shall stop the escalator at a rate not greater than 914 mm (3 ft) per second squared in the direction of travel. The upper and lower skirt devices shall be located so that the escalator will stop before that object reaches the comb

plate. The activation of any skirt device shall stop the escalator when a load equal to the brake rated load is applied while the escalator is running.

Delete and revise Section 6.1.6.3.13 to read as follows:

**6.1.6.3.13 Comb-step impact devices.** Devices of the manual reset type shall be provided that will cause the opening of the power circuit to the escalator driving machine motor and brake if either:

- (a) A horizontal force greater than 1780 N (400 lbf.) in the direction of travel is applied at either side, or greater than 3560 N (800 lbf) is applied at the center of the front edge of the comb plate; or
- (b) A resultant vertical force greater than 268 N (60 lbf) in the upward direction is applied at the center of the front of the comb plate.

Add new Section 6.1.6.3.16 to read as follows:

**6.1.6.3.16 Service ports.** Service ports used for diagnostic purposes or for resetting faults, shall be placed in a location accessible only to elevator personnel.

Add new Section 6.1.6.3.17 to read as follows:

**6.1.6.3.17 Phase protection of motors.** Escalators having a polyphase alternating current power supply shall be provided with means to remove power from the drive motor and brake if a reversal of phase rotation, or phase failure of the incoming polyphase alternating-current power occurs.

Delete and revise Section 6.1.6.9.2 to read as follows:

**6.1.6.9.2 Additional signs and monitors.** Signs and monitors in addition to those required by Section 6.1.6.9.1 relating to cautions or warnings applying to escalator passengers, when provided, shall be in a readily visible location, and limited to conveying any additional cautions and/or warnings. The additional signs and monitors shall be prohibited in the area starting from 3000 mm (118 in.) horizontally outward from the end of the newel and to the point where the steps start to move vertically. Its location shall not impede or otherwise cause persons about to board the escalator to suddenly pause or stop. The sign shall comply with ANSI Z535.2.

Add new Section 6.1.6.9.3 to read as follows:

**6.1.6.9.3 Additional signs or graphics.** Signs or graphics other than those specified in Section 6.1.6.9.1 and Section 6.1.6.9.2 shall not be permitted adjacent to the escalator in such a manner that obstructs boarding passenger view of the signs required in Section 6.1.6.9.1, obstructs or reduces passenger access to the handrails, within the safety zone (see Section 6.1.3.6.4), nor on the escalator except for signs, graphics, manufacturer's identification, owner's identification or markings. They shall not be distracting, create passenger flow hazards, or impair function of safety devices. Step riser signs or graphics, and handrail signs or graphics are not permitted.

Add new Section 6.1.9 to read as follows:

**6.1.9 New York City identification number.** Each escalator shall be assigned a unique numerical identification a minimum of 6 mm (0.25 in) in height. The city identifica-



tion number shall be applied on the right hand side, facing the newel, at the top and bottom of the escalator as well as the following locations:

- (a) The driving machine;
- (b) Controller;
- (c) Main line disconnect switch.

**Add new Section 6.1.9.1 to read as follows:**

**6.1.9.1 Building identification number.** Each escalator shall be assigned a unique alphabetical or numerical identification, a minimum of 6 mm (0.25 in.) in height. The building identification number shall be applied on the exterior, clearly visible, at the top or bottom of the escalator.

**Delete and revise Section 6.2.6.3.11 to read as follows:**

**6.2.6.3.11 Comb-pallet impact devices.** Devices of the manual reset type shall be provided that will cause the opening of the power circuit to the moving walk driving-machine motor and brake if either:

- (a) A horizontal force greater than 1780 N (400 lbf) in the direction of travel is applied at either side, or greater than 3560 N (800 lbf) is applied at the center of the front edge of the combplate; or
- (b) A resultant vertical force greater than 268 N (60 lbf) in the upward direction is applied at the center of the front of the combplate.

**Add new Section 6.2.6.3.13 to read as follows:**

**6.2.6.3.13 Phase protection of motors.** Moving walks having a polyphase alternating current power supply shall be provided with means to remove power from the drive motor and brake if a reversal of phase rotation, or phase failure of the incoming polyphase alternating-current power occurs.

**Add new Section 6.2.6.3.14 to read as follows:**

**6.2.6.3.14 Service ports.** Service ports used for diagnostic purposes or for resetting faults, shall be placed in a location accessible only to elevator personnel.

**Add new Section 6.2.6.8.3 to read as follows:**

**6.2.6.8.3 Additional signs or graphics.** Signs or graphics other than those specified in Sections 6.2.6.8.1 and 6.2.6.8.2 shall not be permitted adjacent to the walk in such a manner that obstructs boarding passenger view of the signs required in Section 6.2.6.9.1, obstructs or reduces passenger access to the handrails, within the safety zone, nor on the moving walk except for signs, graphics, manufacturer's identification, owner's identification, or markings required by the *New York City Building Code*. They shall not be distracting, create passenger flow hazards, or impair function of safety devices. Handrail signs or graphics are not permitted on the moving walk.

**Add new Section 6.2.9 to read as follows:**

**6.2.9 New York City identification number.** Each moving walk shall be assigned a unique numerical identification a minimum of 6 mm (0.25 in) in height. The city identification number shall be applied on the right hand side, facing the newel, at both ends of the moving walk as well as the following locations:

- (a) The driving machine;
- (b) Controller;
- (c) Main line disconnect switch.

**Add new Section 6.2.9.1 to read as follows:**

**6.2.9.1 Building identification number.** Each moving walk shall be assigned a unique alphabetical or numerical identification, a minimum of 6 mm (0.25 in) in height. The building identification number shall be applied on the exterior, clearly visible, at either end of the moving walk.

## PART 7 DUMBWAITERS AND MATERIAL LIFTS

### SECTION 7.4 MATERIAL LIFTS WITHOUT AUTOMATIC TRANSFER DEVICES

#### 7.4.2 Classification

**Delete and revise Section 7.4.2 to read as follows:**

##### 7.4.2 Classification of material lifts.

- (a) Type A Material Lifts shall conform to ASME B20. 1.
- (b) Type B Material Lifts are not permitted.

### SECTION 7.5 ELECTRIC MATERIAL LIFTS WITHOUT AUTOMATIC TRANSFER DEVICES

#### 7.5.1.2 Car doors and gates.

**Delete and revise Section 7.5.1.2.1 to read as follows:**

**7.5.1.2.1** Requirement Section 2.14.4.1 applies to Type A Material Lifts.

#### 7.5.3 Capacity and loading.

**Add new Section 7.5.3.5 to read as follows:**

**7.5.3.5** The maximum capacity shall be 1134 kg. (2500 lbs.) at 23 kg/m<sup>2</sup> (50 lbs. per square ft).

#### 7.5.5 Speed governors.

**Delete and revise Section 7.5.5.1 to read as follows:**

**7.5.5.1** The requirements of Section 2.18.1 apply, except the rated speed shall be modified to read 0.125m/s (25 ft/min).

#### 7.5.12 Operating devices and control equipment.

**Delete and revise Section 7.5.12.1.5 to read as follows:**

**7.5.12.1.5** The requirements of Section 2.26.2.5 do not apply. An emergency stop switch (switches) conforming to Section 2.26.2.5 (a), (b), and (c) shall be provided to stop operation of the material lift, and the door and gate operation (if power operated). The emergency stop switch shall be located in each hall station.

**Delete and revise Section 7.5.12.1.10 to read as follows:**

**7.5.12.1.10** The requirement of Section 2.26.2.15 applies.

## PART 8 GENERAL REQUIREMENTS

### SECTION 8.1 SECURITY

**8.1.2 Group 1: Restricted.****Add new Note (p) to Section 8.1.2 to read as follows:**

(p) The requirements of Section 2.14.1.10 and Section 5.1.11.1.2(d), side emergency exit doors apply.

**8.1.4 Group 3: Emergency operation.****Delete and revise Section 8.1.4 to read as follows:**

**8.1.4 Group 3: Emergency operation.** Group 3 covers access or operation of equipment by fire fighters and emergency personnel. This key shall be a citywide standard key 2642 as defined by the New York City Fire Department.

### SECTION 8.4 ELEVATOR SAFETY REQUIREMENTS FOR SEISMIC RISK ZONE 2 OR GREATER

**8.4.4 Car enclosures, car doors and gates and car illumination.****Delete Section 8.4.4 in its entirety.**

### SECTION 8.6 MAINTENANCE, REPAIR, AND REPLACEMENT

**Delete and revise section 8.6.4.6 to read as follows:****8.6.4.6 Brakes**

**8.6.4.6.1** The driving-machine brake shall be maintained annually to ensure proper operations, including, but not limited to the following:

- (a) residual pads (antimagnetic pads);
- (b) lining and running clearances;
- (c) pins and levers;
- (d) springs;
- (e) sleeves and guide bushings;
- (f) discs and drums; and
- (g) brake coil and plunger.

**8.6.4.6.1.1** Brake maintenance shall be entered in the maintenance records.

**8.6.4.6.1.2** A metal tag indicating the elevator maintenance company and date of service shall be attached to the elevator controller.

**8.6.4.6.2** If any part of the driving machine brake is changed or adjusted that can affect the holding capacity or decelerating capacity of the brake when required (see Section 2.24.8.3), it shall be adjusted and checked by means that will verify its proper function and holding capacity.

**8.6.4.10 Refastening or resocketing of car hoisting ropes on winding-drum machines.****Delete and revise Section 8.6.4.10.1 to read as follows:****8.6.4.10.1 General.**

- (1) The hoisting ropes of elevators having winding-drum driving-machines with 1:1 roping, if of the babbitted rope socket type, shall be resocketed at intervals no longer than:
  - (a) One (1) year, for machines located over the hoistway;
  - (b) Two (2) years, for machines located below or at the side of the hoistway;
  - (c) Four (4) years, for all counterweight cable ends of drum machines;
- (2) In addition to the foregoing requirements, rope fastenings shall be resocketed when an inspection reveals any evidence of failure at the shackle regardless of the period of time since last re-shackling.
- (3) Where auxiliary rope-fastening devices conforming to the requirements of Section 2.20.10 or where car hoist ropes with an additional approved type emergency clamping devices are installed, refastening at the period specified is not required provided that, where such devices are installed, all hoisting ropes shall be refastened on the failure or indication of failure of any rope fastening. Wedge clamp shackles shall not be used on drum machines.
- (4) Where the elevator is equipped with a drum counterweight, the fastenings shall be examined for fatigue or damage at the socket. Where fatigue or damage is detected, the ropes shall be refastened in conformance with Section 8.6.4.10.2.

**Delete and revise Section 8.6.4.10.3 to read as follows:**

**8.6.4.10.3 Tags.** A legible metal tag shall be securely attached through one of the tapered rope sockets during each resocketing, (as shown in the diagram below) and shall bear the following information:

- (a) The name of the person or firm who performed the resocketing and;
- (b) The date on which the rope was resocketed. The material and marking of the tags shall conform to Section 2.16.3.3, except that the height of the let-

ters and figures shall be not less than 1.5 mm (0.0625 in.).

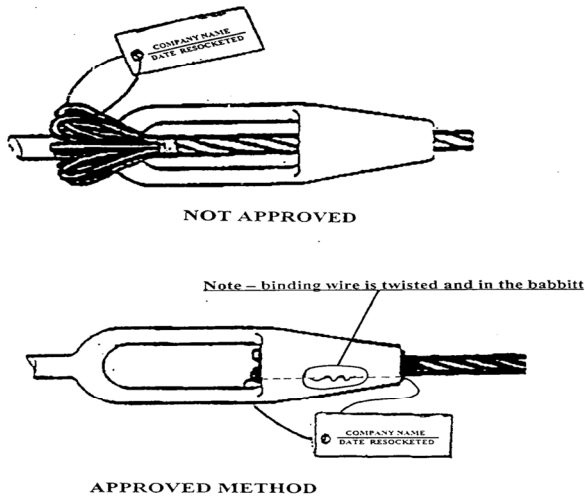


Diagram 8.6.4.10.3

#### 8.6.8.3 Step/skirt performance index.

Delete Section 8.6.8.3 in its entirety.

### SECTION 8.7 ALTERATIONS

#### 8.7.2 Alterations to electric elevators.

Delete and revise subsection 8.7.2.10.1(c) to read as follows:

- (c) Where an alteration is made to any hoistway entrance, it shall conform to Sections 2.11.3, 2.11.5, 2.11.6.5, 2.11.7, 2.11.8, and 8.7.2.10.5. The entire installation shall also conform to Sections 2.12 and 2.13.

#### Add new subsection 8.7.2.10.6

**8.7.2.10.6 Intermediate hoistway entrances placed out of service.** Where permitted by the *New York City Building Code*, an intermediate hoistway entrance placed out of service shall comply with the following:

- (a) Interlocks shall remain in the safety circuit with door panel(s) separately secured in closed position on the hoistway side.
- (b) Eliminate the capability of automatic elevators from opening the car doors at the floor placed out of service.
- (c) Egress and firefighters' service shall not be compromised,
- (d) Associated labeling and signaling shall be removed.

Delete and revise Section 8.7.2.13, Subsection (c) to read as follows:

#### 8.7.2.13 Door reopening device.

- (c) When firefighters' emergency operation is provided, door reopening devices and door closing during Phase I and Phase II shall comply with the requirements applicable at the time of installation or alteration.

#### 8.7.2.14 Car enclosures, car doors, and gates and car illumination.

Delete and revise Section 8.7.2.14.1 to read as follows:

**8.7.2.14.1** Where an alteration consists of the installation of a new car, the installation shall conform to Sections 2.12.6, 2.14, 2.15, and 2.17 (see also Section 8.7.2.15.1).

Delete and revise Subsection (e) of Section 8.7.2.14.2 to read as follows:

#### 8.7.2.14.2

- (e) Side emergency exits may be permanently fixed in the closed position provided that the corresponding side emergency exit on an adjacent car shall also be fixed in the closed position. The installation shall conform to Section 2.12.6.

Delete and revise Section 8.7.2.14.3, Subsection (b), Item (2) to read as follows:

#### 8.7.2.14.3

- (2) Smoke development of 0 to 100.

#### 8.7.2.17 Change in travel or rated speed.

Add new Items (4) and (5) to 8.7.2.17.1, Subsection (c) to read as follows:

#### 8.7.2.17.1 Increase or decrease in travel.

- (4) Where the only hoistway alteration is the decrease in travel at the upper end of the travel, the installation shall be modified as follows:
  - (i) Terminal stopping devices shall be provided based on the new top terminal landing location and the final limit switch shall be of the manual reset type.
  - (ii) A key controlled switch shall be provided in accordance with Section 8.1.5 (i.e., Group 1) requirements to by-pass the new top terminal stopping devices, when the elevator transfer switch is placed in the top-of-car inspection operation position, for access to the hoistway above the terminal landing.
 

The switch shall be manually operated, be labeled "Terminal By-Pass," and shall have two (2) positions; by-pass and normal.

The switch shall be located in the hoistway, in the vicinity of the terminal limits and shall be accessible to a person standing on the car top. The car transfer switch shall not be removed from the top-of-car inspection operation position until the terminal limit by-pass switch is placed in the Normal position.
  - (iii) Existing terminal stopping devices shall remain functional. The hoistway door electro-mechanical safety interlocks shall remain in the safety circuit and locked with door

panel(s) separately secured in closed position on the hoistway side.

(iv) Associated floor labeling and signaling shall be removed.

(5) For manually operated elevators, as an exception to Item 4, the hoist ropes shall be extended and the upper limit switches shall be lowered to the new top terminal landing. Access for maintenance and inspection of the equipment at the top of the hoistway shall be provided.

#### **8.7.2.25 Driving machines and sheaves.**

**Delete and revise Subsection (a) of Section 8.7.2.25.1 to read as follows:**

##### **8.7.2.25.1 Alterations to driving machines and sheaves.**

(a) Where a driving machine is installed as part of an alteration, the installation shall conform to Sections 2.7.2.2, 2.9, 2.10.1, 2.19, 2.20, 2.24, and 2.26.8. The requirements of Sections 2.7.2.2 and 2.19 shall apply only to the extent that the existing installation permits.

#### **8.7.2.27 Operating devices and control equipment.**

**Delete and revise Subsection (a) of Section 8.7.2.27.4 to read as follows:**

##### **8.7.2.27.4 Controllers.**

(a) Where a controller is installed as part of an alteration, it shall conform to Sections 2.22, 2.25, 2.26.1.4, 2.26.1.5, 2.26.4 through 2.26.9, and 2.27.2 through 2.27.8.

**Delete and revise Subsection 8.7.2.27.5(e) to read as follows:**

##### **8.7.2.27.5 Change in type of motion control.**

(e) Ascending car overspeed protection and unintended car movement protection shall conform to Section 2.19 to the extent that the existing installation permits. Where hoisting machinery is retained or altered in such a way that makes the installation of an emergency braking system per Section 2.19.3 impossible, conformance with Section 2.19 is not required.

## **SECTION 8.8 WELDING**

### **8.8.1 Qualification of welders.**

**Delete and revise Section 8.8.1 read as follows:**

**8.8.1 Qualification of welders.** Where required elsewhere in the New York City Building Code, welding of parts, except for tack welds later incorporated into finished welds, shall be undertaken:

(a) by welders qualified in accordance with the requirements of Section 5 of AWS D1.1, whereby the welders shall be qualified by the manufacturer or contractor; a professional consulting engineer; or a recognized testing laboratory; and

(b) as per department rules.

## **SECTION 8.10 ACCEPTANCE INSPECTIONS AND TESTS**

### **8.10.1 General requirements for acceptance inspections and tests.**

**Delete and revise Section 8.10.1.1.3 to read as follows:**

#### **8.10.1.1 Persons authorized to make inspections and tests.**

**8.10.1.1.3** The inspector shall be a special inspector who meets the qualifications prescribed by rule of the department.

### **8.10.2 Inspection and test requirements for new installations.**

**Delete and revise Subsection (o) of Section 8.10.2.2.2 to read as follows:**

#### **8.10.2.2.2 Machine room.**

(o) Braking System. For passenger elevators and all freight elevators, the brake shall be tested for compliance with applicable requirements. A test of the brake shall be made with 125 percent of load. When the car returns to one of the lower landings, the main line switch shall be pulled while the car is running at inspection speed to ensure the brake has set and holds the load. The driving machine shall safely lower, stop, and hold the car with this load. Freight elevators of class C-2 loading shall sustain and level the elevator car. (Section 2.16.6) (Item 2.15 of ASME A17.2).

(1) Braking system (Section 2.24.8.2.2).

(2) Electromechanical brake (Section 2.24.8.3).

### **8.10.4 Acceptance inspection and tests of escalators and moving walks.**

**Delete and revise Subsection (p) of Section 8.10.4.1.1 to read as follows:**

#### **8.10.4.1.1 External inspection and tests.**

(p) Skirt Panels (Items 1.17 and 3.17 of ASME A17.2)

(1) Clearance between skirt and steps (Section 6.1.3.3.5 or Section 6.2.3.3.5(a), and Section 6.2.3.3.6(a)).

(2) Height above step (Section 6.1.3.3.6(a) or Section 6.2.3.3.5(b), and Section 6.2.3.3.6(b)).

(3) Deflection (Section 6.1.3.3.6(b) or Section 6.2.3.3.6(c)).

(4) Smoothness (Section 6.1.3.3.6(c) or Section 6.2.3.3.6(d)).

### **8.10.5 Acceptance inspection and tests of other equipment.**

**Delete Section 8.10.5.3 in its entirety.**



## SECTION 8.11 PERIODIC INSPECTIONS AND TESTS

### 8.11.1 General requirements for periodic inspections and tests.

Delete and revise Section 8.11.1.1 to read as follows:

**8.11.1.1 Persons authorized to make inspections and tests.** The inspector shall be a special inspector who meets the qualifications prescribed by rule of the department.

Delete and revise Section 8.11.1.3 to read as follows:

**8.11.1.3 Periodic inspection and test frequency.** See Chapter 3 of Title 28 of the Administrative Code.

(NOTE: Required intervals for periodic inspections and tests can be found in Table N1 as modified by this appendix.)

Delete and revise Section 8.11.1.4 to read as follows:

**8.11.1.4 Installation placed out of service.** An installation placed out of service permanently or temporarily so that it cannot be operated for a definite period shall comply with the following requirements:

**8.11.1.4.1 Elevators not in use but available for service.** Elevators not in use but available for service are those elevators whose power feed line has been disconnected by opening the main line switch. All required tests shall be regularly performed and a periodic inspection shall be made, and fees shall be paid pursuant to the New York City Building Code. An elevator inspector shall verify that these tests and inspections are being performed, and that the power was interrupted.

**8.11.1.4.1.1 Elevators placed out of service (dismantled).** Elevators that are dismantled shall have power feed lines disconnected from the main line disconnect switch and shall meet the requirements of subsections (a) or (b), below:

- (a) An electric elevator, dumbwaiter, sidewalk elevator or material lift whose suspension ropes have been removed, whose car and counterweight rest at the bottom of the hoistway, and whose hoistway doors have been permanently barricaded or sealed in the closed position on the hoistway side; or
- (b) A hydraulic elevator, dumbwaiter, sidewalk elevator or material lift whose car rests at the bottom of the hoistway; whose pressure piping has been disassembled and a removed from the premises; whose hoistway doors have been permanently barricaded or sealed in the closed position.

In addition, an application to dismantle the elevator shall be filed with the department and an inspection fee charged. Thereafter, one (1) additional inspection per year shall be made to verify that the status is unchanged and fees shall be paid for such inspection. Before the installation is put back in service, an application to restore service

shall be filed with the department. For access to the bottom of the hoistway, the requirements of Section 8.11.1.4.1.2(b)(4) shall apply.

**8.11.1.4.1.2 Elevators removed and permanently discontinued – one elevator shaftway.** When a single elevator with one elevator shaftway is removed and permanently discontinued, an application shall be filed with the department and inspection fees charged. Such process shall meet the following requirements:

- (a) If it is proposed to extend the floor at every story of the building, the new construction shall be the same or of similar construction as the existing adjacent floor and of equivalent or better fire resistive rating. All hoistway equipment shall be completely removed; rails may remain.
- (b) If the hoistway shaft is to remain open:
  - (1) All hoistway equipment shall be completely removed; rails may remain. Except as provided in Item 4, all door and window assemblies opening onto masonry shaftway and masonry enclosed associated machine rooms shall be completely removed and the open space so created shall be filled with the same or similar material of equal thickness and of equivalent or better fire-resistive rating as the adjacent masonry.
  - (2) Except as provided in Item 3, all door and window assemblies opening onto the hoistway shaft that were originally enclosed with an open wire screen and subsequently enclosed with other than masonry units (i.e., metal lath and plaster or transit boards) shall remain. Such door and window assemblies shall be fastened in a closed position and shall be adequately welded or bolted shut. The assembly shall be enclosed in material of equal or similar thickness of equivalent or better fire-resistive rating as the adjacent enclosure.
  - (3) The sidewalk elevator door at the street level shall be fastened in a closed position and shall be adequately welded shut. The underside of such door shall be properly reinforced and supported by steel beams and columns to support the same loading as the sidewalk.
  - (4) Firefighter access to the bottom of the hoistway (elevator pit) shall be provided through the door assembly of the pit door and shall meet the following requirements:

- (i) If the machine room is located at or near the level of the bottom of the shaftway and is so located that access to the bottom of the shaftway is readily available through the machine room, the door to the machine room shall be kept closed with a heavy-duty dead bolt locking device.
- (ii) If the machine room is located other than at or near the level of the bottom of the shaftway or the bottom of the shaftway is not otherwise readily accessible through the machine room, the lowermost door opening onto the shaftway shall be kept closed with a heavy-duty dead bolt locking device. A conspicuous sign of 26 mm (1 in.) block letters with contrasting background permanently affixed to the door and shall read "HOISTWAY."
- (iii) The key to the locking device required in Items (i) and (ii) above shall be kept by the building superintendent and shall be readily available to the commissioner or the commissioner's representative and to firefighters.
- (c) The ventilation opening (smoke hole) in the flooring provided at the top of the hoistway immediately below the sheaves or at the level of the top of the machine room floor beams and the ventilation opening at the exterior portion of the machine room shall be maintained.
- (d) All electric service to the elevator hoistway and machine room shall be disconnected outside the confines of the elevator hoistway and machine room.

**8.11.1.4.1.3 Elevators removed and permanently discontinued – multielevator shaftway.** When a single elevator in multielevator shaftway is removed and permanently discontinued, an application shall be filed with the department and inspection fees charged. Such process shall meet the following requirements:

- (a) If it is proposed to extend the floor at every story of the building, the new construction shall be the same or of similar construction as the existing adjacent floor and of equivalent or better fire resistive rating. All hoistway equipment for the discontinued elevator shall be completely removed; rails may remain. The shaft enclosure shall be rearranged so that the remaining operating

elevators are properly enclosed to maintain the integrity of the shaftway.

- (b) If the hoistway shaft is to remain open:
  - (1) All hoistway equipment for the discontinued elevator shall be completely removed; rails may remain. All door assemblies serving the discontinued elevator, openings onto masonry shaftway shall be completely removed and the open space so created shall be filled with the same or similar material of equal thickness of equivalent or better fire-resistive rating as the adjacent masonry.
  - (2) All door assemblies serving the discontinued elevator, opening onto the hoistway shaft that were originally enclosed with an open wire screen and subsequently enclosed with other than masonry units (i.e. metal lath and plaster or transite boards), shall remain. Such door assemblies shall be fastened in a closed position and shall be adequately welded shut. The assembly shall be enclosed in material of equivalent or better fire resistive rating as the adjacent enclosure.

#### **8.11.1.4.2 Escalator installation placed out of service.**

**8.11.1.4.2.1 Escalators not in use but available for service.** Escalators not in use but available for service are those escalators whose power feed lines have been disconnected from the main line disconnect switch and whose entrances have been barricaded. All required tests shall be regularly performed and a periodic inspection shall be made, and fees shall be paid pursuant to the New York City Building Code. An elevator inspector shall verify that these tests and inspections are being performed, and that the power was interrupted.

**8.11.1.4.2.2 Escalators discontinued or placed out of service.** Escalators discontinued or placed out of service shall comply with Section 8.11.1.4.2.1. An application shall be filed with the department and an inspection fee charged. Thereafter, one (1) additional inspection per year shall be made to verify that the status is unchanged and fees shall be paid for such inspection. Before the installation is put back in service, it shall be subject to all of the routine and periodic inspections and tests required by the New York City Building Code.

**8.11.1.4.2.3 Escalators removed and permanently discontinued.** An application shall be filed with the department and inspection fees charged. The escalator steps, newels, rails, all wire cables, and other equipment and machinery shall be completely removed. An opening created by the removal of the escalator shall be filled with new construction of the

same or similar construction as the existing adjacent floor and of equivalent or better fire restive rating.

**8.11.1.4.3 Moving walk installation placed out of service.**

**8.11.1.4.3.1 Moving walks not in use but available for service.** Moving walks not in use but available for service are those moving walks whose power feed lines have been disconnected from the main line disconnect switch and whose entrances have been barricaded. All required tests shall be regularly performed and a periodic inspection shall be made and fees charged. An elevator inspector shall verify that these tests and inspections are being performed, and that the power was interrupted.

**8.11.1.4.3.2 Moving walk discontinued or placed out of service.** Moving walks discontinued or placed out of service shall meet the requirements of Section 8.11.1.4.3.1 except for periodic inspection. An application shall be filed with the department and inspection fees charged. Thereafter, one additional inspection per year shall be made to verify that the status is unchanged and fees shall be paid for such inspection. Before the installation is placed back in service, it shall be subject to all of the routine and periodic inspections and tests required by the New York City Building Code.

**8.11.1.4.3.3 Moving walk removed and permanently discontinued.** An application shall be filed with the department and inspection fees charged. The moving walk treadways, newels, rails, all wire cables, and other equipment and machinery shall be completely removed. The truss may remain. An opening created by the removal of the moving walk shall be covered by new construction of the same or similar construction as the existing adjacent floor and of equivalent or better fire resisting rating.

**Delete and revise Section 8.11.4.1 (v) as follows:**

- (v) Code Data Plate (Section 2.23.2) (Item 2.14). (Category 1 test only.)

**Delete and revise Table N1 as follows:**

TABLE N1 REQUIRED INSPECTION AND TEST INTERVALS IN "MONTHS"													
			Periodic Test on Behalf of Owner (4)										
Reference Code	Equipment Type	Periodic Inspection By Department		Category 1 (2)		Category 3 (Unexposed Pistons of Roped Water Hydraulic elevators and Pressure Vessels)		Category 5 (5)		Notifications (1)(3)	Filing (1)(3)	Performing (1)(3)	Witnessing Agency (1)(3)
		Requirement	Interval	Requirement	Interval	Requirement	Interval	Requirement	Interval				
ASME A17.1	Electric Elevators	8.11.2.1	1-1 to 12-31	8.11.2.2	1-1 to 12-31	N/A	N/A	8.11.2.3	60	Yes (Cat. 5)	Yes	Yes	Yes
ASME A17.1	Hydraulic Elevators	8.11.3.1	1-1 to 12-31	8.11.3.2	1-1 to 12-31	8.11.3.3	36	Roped 8.11.3.4	60	Yes (Cat. 3,5)	Yes	Yes	Yes
ASME A17.1	Escalators & Moving Walks	8.11.4.1	1-1 to 12-31	8.11.4.2	1-1 to 12-31	N/A	N/A	N/A	N/A	Yes (Cat. 1)	Yes	Yes	Yes
ASME A17.1	Sidewalk Elevators	8.11.5.1	1-1 to 12-31	8.11.5.1	1-1 to 12-31	N/A	N/A	8.11.5.1	60	Yes (Cat. 5)	Yes	Yes	Yes
ASME A17.1	Dumbwaiters	8.11.5.4	1-1 to 12-31	8.11.5.4	1-1 to 12-31	N/A	N/A	8.11.5.4	60	No	Yes	Yes	No
ASME A17.1	Material Lifts	8.11.5.5	1-1 to 12-31	8.11.5.5	1-1 to 12-31	N/A	N/A	8.11.5.5	60	No	Yes	No	No
ASME A17.1	Special Purpose Personnel Elevators	8.11.5.6	1-1 to 12-31	8.11.5.6	1-1 to 12-31	N/A	N/A	8.11.5.6	60	No	Yes	Yes	No
ASME A17.1	Inclined Elevators	8.11.5.7	1-1 to 12-31	8.11.5.7	1-1 to 12-31	N/A	N/A	8.11.5.7	60	No	Yes	Yes	No
ASME A17.1	Shipboard Elevators	8.11.5.8	1-1 to 12-31	8.11.5.8	1-1 to 12-31	N/A	N/A	8.11.5.8	60	No	Yes	Yes	No
ASME A17.1	Screw-Column Elevators	8.11.5.9	1-1 to 12-31	8.11.5.9	1-1 to 12-31	N/A	N/A	8.11.5.9	60	No	Yes	Yes	No
ASME A17.1	Rooftop Elevators	8.11.5.10	1-1 to 12-31	8.11.5.10	1-1 to 12-31	N/A	N/A	8.11.5.10	60	No	Yes	Yes	No
ASME A17.1	Rack and Pinion Elevators	8.11.5.11	1-1 to 12-31	8.11.5.11	1-1 to 12-31	N/A	N/A	8.11.5.11	60	No	Yes	Yes	No
ASME A17.1	Limited Use-Limited Application Elevators (Commercial Bldgs. Only)	8.11.5.12	1-1 to 12-31	8.11.5.12	1-1 to 12-31	N/A	N/A	8.11.5.12	60	Yes (Cat. 5)	Yes	Yes	Yes
ASME A17.1	Elevators Used for Construction	8.11.5.13	N/A	8.11.5.13	1-1 to 12-31	N/A	N/A	8.11.5.13	60	No	Yes	Yes	Yes
ASME A18.1	Platform Lifts	10.2	1-1 to 12-31	10.3.1	1-1 to 12-31	10.3.2	36	10.3.3	60	No	Yes	Yes	No
ASME B20.1	Vertical and Inclined Reciprocating Conveyors (VRC)	N/A	N/A	Appendix K2	Appendix K2	N/A	N/A	Appendix K2	Appendix K2	No	No	No	No
ASME A90.1	ManLifts	8.2	1-1 to 12-31	8.1	1-1 to 12-31	N/A	N/A	N/A	N/A	No	Yes	Yes	Yes
	Private Residence	N/A	N/A										
ASME A17.1	PR Elevators	N/A	N/A	8.11.5.2	1-1 to 12-31	N/A	N/A	8.11.5.2	60	No	Yes	Yes	No
ASME A17.1	PR Dumb-waiters	N/A	N/A	8.11.5.4	1-1 to 12-31	N/A	N/A	8.11.5.4	60	No	No	No	No
ASME A18.1	PR Platform Lifts	N/A	N/A	10.3.1	1-1 to 12-31	10.3.2	10.3.2	10.3.3	60	No	No	No	No
ASME A18.1	PR Stairway Chair Lifts	N/A	N/A	10.3.1	1-1 to 12-31	N/A	N/A	N/A	NA	No	No	No	No

Notes:

(1) Where filing with the Department is not required, Owner shall perform inspection and maintain log of each inspection/test performed as required by the *New York City Building Code* and available to the Department upon request.

(2) For Category 1 Inspection/Test, a minimum six (6) month time interval from the date of previous calendar year Category 1 Inspection/Test.

(3) See Article 304

(4) Dismantled devices do not require Category 1, 3 or 5 Tests.

(5) Category 5 Tests are due by the last day of the month on the 5<sup>th</sup> anniversary. For example, if the Category 5 Test was last performed on 7/1/09, then the Category 5 Test must be performed by 7/31/14.



**Delete and revise Section 8.11.1.6 to read as follows:**

**8.11.1.6 Test tags.** A metal test tag with the test date, the category number requiring the test, and the name of the person or firm performing the test shall be installed in the machine room and at the vicinity of the lower starting station of escalators and moving walks for all Category 1, 3 and 5 tests.

**Delete and revise Section 8.11.2.3.4 to read as follows:**

**8.11.2.3.4 Braking system.** For passenger elevators and all freight elevators, the brake shall be tested for compliance with applicable requirements. The load shall be placed in the car as shown in Table 8.11.2.3.4 and the car run to the lowest landing by normal operating means. The driving machine shall safely lower, stop and hold the car with this load. Freight elevators of Class C-2 loading shall sustain and level the elevator car.

A test of the brake shall be made in accordance with Section 8.10.2.2.2 (o).

**Delete Section 8.11.4.2.19 in its entirety.****Delete and revise Section 8.11.4.2.20 to read as follows:**

**8.11.4.2.20 Clearance between step and skirt.** Escalators shall be tested as follows:

The clearance between step and skirt shall be taken at each step. These measurements shall be made independently on each side of the escalator.

## CHAPTER K2 MODIFICATIONS TO ASME B20.1-2006, SAFETY STANDARD FOR CONVEYORS AND RELATED EQUIPMENT

**K201.1 General.** As referenced in Section 3001.2 of the *New York City Building Code*, the provisions of ASME B20.1—06 shall be modified in accordance with this chapter. The section numbers correlate to those in the referenced ASME standard. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

### 1 SCOPE

**Delete and revise the text of Section 1 to read as follows:**

This standard applies to the design, construction, installation, maintenance, inspection, and operation of conveyors and conveying systems in relation to hazards. The conveyors may be of the bulk material, package, or unit handling types where the installation is designed for permanent, temporary, or portable operation.

This standard shall apply, with the exceptions noted below, to all conveyor installations.

This standard specifically excludes any conveyor designed for, installed for, or used for the movement of human beings. This standard does, however, apply to certain conveying devices that incorporate within their supporting structure,

work stations or operator's stations specifically designed for authorized personnel.

This standard does not apply to conveyors such as underground mine conveyors for which specific standards are already in effect, or to equipment such as industrial trucks, tractors, trailers, automatic guided vehicles, tiering machines (except pallet load tierers), cranes, hoists, power shovels, power scoops, bucket drag lines, trenchers, platform elevators designed to carry passengers or operator, manlifts, moving walks, moving stairways (escalators), highway or railroad vehicles, cableways, tramways, dumbwaiters, pneumatic conveyors, robots or integral machine transfer devices. Some of the foregoing have specific standards.

## 4 DEFINITIONS

**Delete and revise the definition "Conveyor, vertical reciprocating" in Section 4 to read as follows:**

**CONVEYOR, VERTICAL RECIPROCATING.** A permanent reciprocating power or gravity actuated unit (not designed to carry passengers or an operator) that receives objects on a carrier and transmits these objects vertically between two or more levels.

## 6 SPECIFIC SAFETY STANDARDS

**Add a new section 6.6.3 to read as follows:**

**6.6.3. Incline reciprocating conveyor testing.** Incline reciprocating conveyors shall be inspected and tested as per Section 6.12.3.

**6.21 Vertical reciprocating conveyors.****6.21.1 Add new Subsections d, e, f, g, h, i, j and k to Section 6.21.1 to read as follows:****6.21.1 Safety considerations.**

- (d) Travel distance shall be limited to less than 22 860 mm (75 ft) with a maximum of four landings served.
- (e) Conveyor(s) shall be enclosed in a 2-hour fire rated hoistway, equipped with a minimum 1½ hour fire-rated entrance at each landing served.
- (f) Access at landings shall be a restricted area for authorized personnel with no public access.
- (g) Where there is an occupied space or an unoccupied space not secured against unauthorized access under the hoistway, the conveyor shall be equipped with a safety designed to stop and hold the conveyor with the rated full load capacity independent of the hoisting or driving mechanism.
- (h) The operating device shall not be located inside the conveyor enclosure and must be external to the hoistway at each landing served.
- (i) The system shall incorporate a position indicator at each floor landing to register the location of the conveyor.

- (j) The rated load capacity shall not be less than 239 kg/m<sup>2</sup> (49 lbs. per sq ft) with a maximum capacity of 9072 kg (20,000 lbs).
- (k) The rated speed shall not exceed 406 mm/sec (80 FPM).
- (l) VRCs are permitted only in commercial and industrial occupancies.

**6.21.2 Delete and revise Subsections (b), (c) and (d) of Section 6.21.2 to read as follows:**

**6.21.2 Guarding.**

- (b) The conveyor housing shall be equipped with doors or equivalent means at each manual landing and unloading station, arranged so that they can be opened only when the carrier is present at the level and such that the carrier cannot be actuated until they are closed. This requirement shall be satisfied by the use of an interlock as required by ASME A17.1, Section 2.12.2.
- (c) Vertical reciprocating conveyors designed to automatically receive and discharge material shall have interlocked doors as in subsection (b) above.
- (d) Where the application requires that personnel walk onto the carrier to load or unload material, the carriers shall be provided with a conveyor enclosure securely fastened to the conveyor platform. The enclosure walls shall be of solid, grille or perforated construction; and shall be of such strength and support that when subjected to a leaning or falling rated load on the conveyor, the enclosure walls will not deflect or deform in a way that reduces running clearances to less than 13 mm (0.5 in.). Enclosure entrance(s) shall be provided with solid doors or gates; and shall guard the full width opening with a minimum height of 2030 mm (80 in.). Grille or perforated portions of conveyor enclosures and entrance gates shall reject a ball 38 mm (1.5 in.) in diameter.

**Add the following new section 6.21.3 to read as follows:**

**6.21.3 Periodic testing.**

- (a) All conveyors shall be inspected and tested as per Table N1 of ASME A17.1 as modified by Chapter K1 of this appendix.
- (b) All safety devices shall be tested on all tests. A static full load test shall be performed every five years to ensure that the conveyor holds the load.

### CHAPTER K3 MODIFICATIONS TO ASME A17.3-2002, SAFETY CODE FOR EXISTING ELEVATORS AND ESCALATORS

**K301.1 Retroactive requirements for existing elevators and escalators.** All existing elevators and escalators shall comply with the provisions of American Society of Mechanical Engineers ("ASME") A17.3-2002 as modified in accordance with this chapter. The section numbers correlate to

those in the referenced ASME standard. This chapter codifies the retroactive requirements for existing elevators and escalators which were originally established by 1 RCNY 3610-01. The date for completion of all work necessary to comply with such requirements is December 14, 2009, except as otherwise specified in this chapter.

## PART I INTRODUCTION

### SECTION 1.5 ALTERATIONS, MAINTENANCE, AND INSPECTIONS AND TESTS

**1.5 Delete and revise Section 1.5 to read as follows:**

Existing installations shall conform to the following requirements of ASME A17.1-00:

- (a) Section 8.10.8.11, Periodic and Acceptance Inspections and Tests;
- (b) Section 8.6.8.7, Alterations, Repairs, Replacements, and Maintenance.

In addition, existing installations shall conform to ASME Addenda A17.1a-02 and A17.1b-03, and Sections 1007.4, 1607.8.1, 3001.2, 3001.4, 3002.5, and 3003.2 of the *New York City Building Code*.

## PART II HOISTWAYS AND RELATED CONSTRUCTION FOR ELECTRIC ELEVATORS

### SECTION 2.1 HOISTWAYS

#### 2.1.1 Hoistway construction.

**Delete Section 2.1.1 in its entirety.**

#### 2.1.2 Windows in hoistway enclosures.

**Delete and revise Section 2.1.2 to read as follows:**

**2.1.2 Windows in hoistway enclosures.** Every hoistway-window opening ten (10) stories or fewer above a thoroughfare, and every such window opening three (3) stories or fewer above the roof of an adjacent building, shall be guarded by one of the following:

- (a) Vertical bars at least  $\frac{5}{8}$  inch $\pm$  (16 mm) in diameter or equivalent, spaced not more than 10 inches (254 mm) apart, permanently and securely fastened in place; or
- (b) Metal-sash windows having solid-section steel muntins of not less than  $\frac{1}{8}$  inch $\pm$  (3.2 mm) thickness, spaced not more than 8 in. (203 mm) apart.

Exterior hoistway-windows shall be marked with the word "SHAFTWAY" in red letters at least 6 inches $\pm$  (152 mm) high on a white background.

#### 2.1.4 Pipes conveying gases, vapors, or liquids.

Delete Section 2.1.4 in its entirety.

### 2.1.5 Counterweight guards.

Delete Section 2.1.5 in its entirety.

## SECTION 2.2 MACHINE ROOMS AND MACHINERY SPACES

### 2.2.5 Pipes conveying gases, vapors, or liquids.

Delete Section 2.2.5 in its entirety.

## SECTION 2.4 CLEARANCES AND RUNBYS

Delete Section 2.4 in its entirety.

## SECTION 2.5 PROTECTION OF SPACES BELOW HOISTWAYS

Delete and revise Section 2.5 to read as follows:

Where the space below the hoistway is not permanently secured against access, cars shall be in compliance with the following requirements by December 14, 2010:

- (a) The cars and counterweights shall be provided with spring or oil buffers.
- (b) Car and counterweight buffer supports shall be of sufficient strength to withstand without permanent deformation the impact resulting from buffer engagement of the car plus the rated load or the counterweight with an empty car at the following speeds:
  - (1) Governor tripping speed where the safety is governor operated;
  - (2) One hundred twenty-five (125) percent of the rated speed, where the safety is not governor operated.

## SECTION 2.6 HOISTWAY ENTRANCES

### 2.6.3 Hoistway door vision panels.

Delete and revise Section 2.6.3 to read as follows:

**2.6.3 Hoistway door vision panels.** Hoistway door vision panels must be protected by protective grills made of number sixteen (16) gauge stainless or galvanized steel in accordance with the following specifications:

- (a) Grills shall be sized to fit within or over the vision panel frame and completely cover the vision panel opening in the elevator, car doors and hoistway doors.
- (b) Grills and vision panel frames shall be secured by means of non-reversible screws or other tamper proof fasteners.
- (c) Grills shall contain openings that shall not be larger than 0.75 inch $\pm$  (19 mm) in diameter.

(d) All cut edges shall be deburred.

(e) The provisions of this section shall apply to both new and existing passenger cars. Requirements for such grills may be waived if certification is submitted that such elevator is operated manually or twenty-four (24) hour doorman service is provided. A security guard shall not be considered doorman service.

(f) For the purposes of this Section 2.6.3, a vandal resistant 0.25 inch $\pm$  (6 mm) polycarbonate sheet, such as Lexan, in two (2) layers, one (1) on each side of the required wire glass, may be used in lieu of the metal protective.

### 2.6.4 Door hangers.

Delete Section 2.6.4 in its entirety.

### 2.6.7 Bottom guides.

Delete and revise Section 2.6.7 to read as follows:

**2.6.7 Bottom guides.** Existing elevators in occupancy groups R-1, R-2 and E shall comply with the following requirements:

- (a) The bottom of each horizontally sliding hoistway door panel shall be equipped with bottom guiding members and bottom safety retainers.
  - (1) The bottom of each horizontally sliding hoistway elevator door panel shall be guided by two or more members as described in ASME A17.1 Section 2.11.11.6.
  - (2) Safety Retainers – The bottom of each horizontally sliding hoistway elevator door panel shall be provided with a means of retaining the door panel in position if the primary guiding means fail, and preventing displacement of the bottom of the door panel by not more than 0.75 inch $\pm$  (19 mm) into the hoistway. Such Retainers shall be installed on the bottom, shaft side of each door panel, shall be fabricated of at least twelve (12) gauge stainless or galvanized steel, and shall engage the corresponding sill member by not less than 0.375 inch $\pm$  (9.5 mm).

**Exception:** New elevator doors installed under the 1996/1997 or later editions of ASME A17.1 as modified by Chapter K1 of this appendix.

- (b) The door panels shall be structurally sound and in such condition that the guide(s) and retainer(s) may be securely attached.
  - (1) At least one (1) bottom guide shall be installed near each end of every door panel.
  - (2) A safety retainer(s) totaling at least 8 inches $\pm$  (203 mm) in length shall be installed between the two (2) outermost guides.
  - (3) On smaller sized door panels, where due to the width of the door panel, the space between the two (2) outermost bottom guides would be less than 8 inches $\pm$  (203 mm), then either:

- (i) The length of the retainer may be reduced to a minimum 4 inches† (102 mm); or
- (ii) When only one (1) bottom guide is provided near the center of the door, a 4 inches† (102 mm) retainer shall be installed on each side of the bottom guide. If the space between the bottom guide and the edge of the door is less than four inches, the length of the retainer may be reduced to the amount of the space between the bottom guide and the edge of the door.

**Exception:** New elevator entrance frames and doors installed under the 1996/1997 or later editions of ASME A17.1 as modified by Chapter K1 of this appendix.

## SECTION 2.7 HOISTWAY DOOR LOCKING DEVICES, PARKING DEVICES, AND ACCESS

Delete and revise Section 2.7.2 to read as follows:

### 2.7.2 Elevator parking device

- (a) *Parking Devices Required.* Elevators that are operated from within the car only and have manual operated doors that can be opened with a common tool, shall have elevator-parking devices installed at that landing. This device shall be located at a height not greater than 6 feet† 11 inches† (2.11 m) above the floor. Parking devices are not required for elevators having hoistway doors that are automatically unlocked when the car is within the landing zone.
- (b) *General Design Requirements.* Parking devices shall conform to the following requirements:
  - (1) They shall be mechanically or electrically operated.
  - (2) They shall be designed and installed so that friction or sticking or the breaking of any springs used in the device will not permit opening or unlocking a door when the car is outside the landing zone of that floor.
  - (3) Springs, where used, shall be of the restrained compression type, which will prevent separation of the parts in case the spring breaks.

Add new Subsection (c) to Section 2.7.2 to read as follows:

- (c) *Car interior lighting.* The car interior lighting shall not be extinguished and must meet the requirements of Section 3.4.5 of ASME A17.3 as modified by this chapter.

### 2.7.3 Access to hoistway.

Delete Section 2.7.3 in its entirety.

### 2.7.4 Restricted opening of hoistway doors and/or car doors on passenger elevators.

Delete Section 2.7.4 in its entirety.

2.7.6 Add new Section 2.7.6 to read as follows:

**2.7.6 Locks on elevators and elevator hoistway doors.** In high rise buildings, no switch, lock or device of any kind shall be installed on any floor on or above the street floor on any elevator car or elevator hoistway door, except elevators used exclusively for freight, that shall prevent opening of such doors by anyone not having a key, unless fire department access to cars and hoistways is provided by a city-wide standard key number 2642 and the New York City Fire Department standard key.

## PART III MACHINERY AND EQUIPMENT FOR ELECTRIC ELEVATORS

### SECTION 3.1 BUFFERS AND BUMPERS

3.1 Delete Section 3.1 in its entirety.

### SECTION 3.3 CAR FRAMES AND PLATFORMS

3.3.1 Car platforms.

Delete Section 3.3.1 in its entirety.

3.3.5 Protection of platforms against fire.

Delete Section 3.3.5 in its entirety.

### SECTION 3.4 CAR ENCLOSURES

3.4.1 Car enclosures.

Delete Section 3.4.1 in its entirety.

3.4.2 Car doors and gates.

Delete and revise Section 3.4.2 to read as follows:

**3.4.2 Car doors and gates.** Passenger and loft elevators shall comply with (a) and (b) of this section by December 14, 2012:

- (a) *Doors, gates, and electric contacts.* Cars shall have a car door or gate provided at each entrance equipped with a car door or gate electric contact. Car doors and/or gates shall conform to the following requirements:
  - (1) They shall be positively opened by a lever or other device attached to and operated by the door or gate.
  - (2) They shall be maintained in the open position by the action of gravity or by a restrained compression spring, or both, or by positive mechanical means.
  - (3) They shall not be readily accessible.
- (b) *Collapsible gates.* Collapsible car gates shall conform to the following requirements:
  - (1) Collapsible car gates shall not be power opened to a distance exceeding one-third ( $1/3$ )



of the clear gate opening, and in no case more than 10 inches† (254 mm).

- (2) When fully closed (extended position), gates shall reject a ball 3 inches† (76 mm) in diameter for passenger elevators and 4.5 inches† (114 mm) for freight elevators.
- (3) Gates shall have at least every fourth vertical member guided at the top and every second vertical member guided at the bottom.
- (4) Handles of manually operated collapsible gates nearest the car operating device on elevators operated from the car only shall be so located that the nearest handle is not more than 48 inches† (1.22 m) from the car operating device when the gate is closed (extended position), and not more than 48 inches† (1.22 m) above the car floor. Gate handles shall be provided with finger guards.

#### 3.4.4 Emergency exits.

Delete Section 3.4.4 in its entirety.

#### 3.4.5 Car illumination.

Delete and revise Section 3.4.5 to read as follows:

**3.4.5 Car illumination.** Car illumination shall comply with the provisions of this section by December 14, 2010:

- (a) Interiors of cars shall be provided with an electric light or lights. Not less than two (2) lamps shall be provided.
- (b) The minimum illumination at the car threshold, with the door closed, shall not be less than:
  - (1) For passenger elevators: 5 footcandles† (54 lux†).
  - (2) For freight elevators: 2 1/2 footcandles† (27 lux†).
- (c) Light control switches are not required, but if provided they shall be located in or adjacent to the operating device in the car. In elevators having automatic operation, they shall be of the key-operated type or located in a fixture with a locked cover.
- (d) Top of car light fixtures may be provided with a non-key-operated switch in or adjacent to the fixture.

### SECTION 3.5 SAFETIES

#### 3.5.1 Car safeties.

Delete Section 3.5.1 in its entirety.

#### 3.5.2 Counterweight safeties.

Delete Section 3.5.2 in its entirety.

#### 3.5.3 Safeties to stop ascending cars or counterweights prohibited.

Delete Section 3.5.3 in its entirety.

#### 3.5.4 Application and release of safeties.

Delete Section 3.5.4 in its entirety.

#### 3.5.5 Maximum permissible movement of governor rope to operate the safety mechanism.

Delete Section 3.5.5 in its entirety.

#### 3.5.6 Rail lubricants and lubricant plate.

Delete and revise Section 3.5.6 to read as follows:

**3.5.6 Rail lubricants.** Rail lubricants or coatings that will reduce the holding power of the safety or prevent its functioning as required shall not be used.

### SECTION 3.6 SPEED GOVERNORS

3.6 Delete Section 3.6 in its entirety.

### SECTION 3.8 DRIVING MACHINES AND SHEAVES

#### 3.8.1 General requirements.

Delete Section 3.8.1 in its entirety.

Add new Section 3.8.4.1 to read as follows:

##### 3.8.4.1 Single plunger brakes.

- (a) All existing traction elevators with single plunger brakes must comply with either of the following by January 1, 2027:
  - (1) Alteration of single plunger assemblies to dual-plunger type, or
  - (2) Compliance with Unintended Car Movement Protection as specified by Section 2.19.2 of ASME A17.1.
- (b) Notwithstanding any inconsistent provision of chapter 1 of title 28 of the *Administrative Code*, the work required to comply with this section may not be performed without a permit from the department.

### SECTION 3.9 TERMINAL STOPPING DEVICES

#### 3.9.1 Normal terminal stopping devices.

Delete Section 3.9.1 in its entirety.

#### 3.9.2 Final terminal stopping devices.

Delete and revise Section 3.9.2 to read as follows:

**3.9.2 Final terminal stopping devices.** Upper and lower final terminal electromechanical stopping devices shall be provided and arranged to prevent movement of the car by the normal operating devices in either direction of travel after the car has passed a terminal landing. Final terminal stopping devices shall be located as follows:

- (a) *Winding drum driving machines.* Elevators having winding drum machines shall have stopping switches on the machines and also installed in the

hoistway and operated by cams attached to the car. Final limit switches and brackets shall be permanently secured and pinned.

- (b) *Traction driving machines.* Elevators having traction driving machines shall have stopping switches installed in the hoistway and operated by cams attached to the car. Final limit switches and brackets shall be permanently secured and pinned.

### SECTION 3.10

#### OPERATING DEVICES AND CONTROL EQUIPMENT

##### 3.10.1 Types of operating devices.

Delete Section 3.10.1 in its entirety.

##### 3.10.3 Top-of-car operating devices.

Delete Section 3.10.3 in its entirety.

##### 3.10.4 Electrical protective devices

Delete and revise Section 3.10.4 to read as follows:

**3.10.4 Electrical protective devices.** Electrical protective devices shall be provided by December 14, 2010 in accordance with the following:

- (a) *Slack-rope switch.* Winding drum machines shall be provided with a slack-rope device equipped with a slack-rope switch of the enclosed manually reset type that shall cause the electric power to be removed from the elevator driving machine motor and brake if the suspension ropes become slack.
- (b) *Compensating rope sheave switch.* Compensating rope sheaves shall be provided with a compensating rope sheave switch or switches mechanically opened by the compensating rope sheave before the sheave reaches its upper or lower limit of travel to cause the electric power to be removed from the elevator driving machine motor and brake.
- (c) *Broken rope, tape, or chain switches used in connection with machine room normal terminal stopping switches.* Broken rope, tape, or chain switches conforming to the requirements of Section 3.6.1 shall be provided in connection with normal terminal stopping devices located in machine rooms of traction elevators. Such switches shall be opened by a failure of the rope, tape, or chain.
- (d) *Car-safety mechanism switch.* A switch shall be required where a car safety is provided.
- (e) *Final terminal stopping devices.* Final terminal stopping devices shall be provided for every elevator.
- (f) *Emergency terminal speed limiting device.* Where reduced stroke oil buffers are provided, emergency terminal speed limiting devices are required.
- (g) *Motor generator overspeed protection.* Means shall be provided to cause the electric power to be removed automatically from the elevator driving machine motor and brake should a motor generator set, driven by a direct current motor, overspeed excessively.
- (h) *Motor field sensing means.* Where direct current is supplied to an armature and shunt field of an elevator driving machine motor, a motor field current sensing means shall be provided, which shall cause the electric power to be removed from the motor armature and brake unless current is flowing in the shunt field of the motor.  
A motor field current sensing means is not required for static control elevators provided with a device to detect an overspeed condition prior to, and independent of, the operation of the governor overspeed switch. This device shall cause power to be removed from the elevator driving machine motor armature and machine brake.
- (i) *Buffer switches for oil buffers used with type C car safeties.* Oil level and compression switches shall be provided for all oil buffers used with Type C safeties.
- (j) *Hoistway door interlocks or hoistway door electric contacts.* Hoistway door interlocks or hoistway door electric contacts shall be provided for all elevators.
- (k) *Car door or gate electric contacts.* Car door or gate electric contacts shall be provided for all elevators with car doors or gates.
- (l) *Normal terminal stopping devices.* Normal terminal stopping devices shall be provided for every elevator.
- (m) *Car side emergency exit electric contact.* An electric contact shall be provided on every car side emergency exit door.
- (n) *Electric contacts for hinged car platform sills.* Hinged car platform sills, where provided, shall be equipped with electric contacts.
- (o) *Emergency stop switch.* On all elevators, an emergency stop switch shall be provided in the car, and located in or adjacent to each car operating panel. When open (i.e. the "stop position"), this switch shall cause the electric power to be removed from the elevator driving-machine motor and brake. Emergency stop switches shall:
  - (1) Be of the manual open and close type;
  - (2) Have red operating handles or buttons;
  - (3) Be conspicuously and permanently marked "STOP" and indicate the "STOP" and "RUN" positions; and
  - (4) When open, cause an audible signaling device to sound.
- (p) *Stop switch in pit.* A stop switch, conforming to the following requirements shall be provided in the pit of every elevator. The switch shall be located adjacent to the normal pit access. The switch shall cause the electric power to be

removed from the elevator driving machine motor and brake and shall:

- (1) Be of the manual open and close type;
  - (2) Have red operating handles or buttons;
  - (3) Be conspicuously and permanently marked "STOP" and indicate the "STOP" and "RUN" positions; and
  - (4) Be positively opened mechanically and its opening shall not be solely dependent on a spring.
- (q) *Buffer switches for gas spring return oil buffers.* A buffer switch shall be provided for gas spring return oil buffers that will cause electric power to be removed from the elevator driving machine motor and brake if the plunger is not within 0.5 inch $\pm$  (13 mm) of the fully extended position.

### 3.10.5 Power supply line disconnecting means.

**Delete Section 3.10.5 in its entirety.**

### 3.10.11 Add new Section 3.10.11 to read as follows:

**3.10.11 Signal systems on car switch elevators.** Elevators with car switch operation shall be provided with a signal system by means of which signals can be given from any landing whenever the elevator is desired at the landing.

### Add new Section 3.10.12 to read as follows:

**3.10.12 System to monitor and prevent automatic operation of passenger and freight elevators with faulty door contact circuits.**

All automatic passenger and freight elevators shall comply with this section by January 1, 2020. Means shall be provided to monitor the position of power-operated car doors that are mechanically coupled with the landing doors or power-operated car doors with manually operated swing-type hall doors, while the car is in the landing zone, in order

- (a) to prevent the operation of the car if the car door is not closed (see Section 3.4.2(c) of ASME A17.3), regardless whether the portion of the circuits incorporating the car-door contact or the interlock contact of the landing door coupled with car door, or both, are closed or open, except as permitted under any of the following conditions:
  - (1) by a car-leveling or truck-leveling device
  - (2) when a hoistway access switch is operated
  - (3) when the top-of-car inspection operation utilizing a car door by-pass or hoistway-door bypass switch is activated
  - (4) when on any mode of inspection operation; and
- (b) to prevent, except as permitted by inspection operation, the power closing of the doors if the car door is fully open and any of the following conditions exist:

- (1) the car-door contact is closed or the portion of the circuit, incorporating this contact is bypassed;
- (2) the interlock contact of the landing door that is coupled to the opened car door is closed or the portion of the circuit, incorporating this contact is bypassed, except when operating during Firefighters' Service Phase II;

**Exception:** For swing-type door operation, the locking (secondary) contacts shall be monitored.

- (3) the car-door contact and the interlock contact of the door that is coupled to the opened car door are closed, or the portions of the circuits incorporating these contacts are bypassed;

**Exception:** For swing-type door operation, the locking (secondary) contacts shall be monitored.

Design and/or controller modifications shall be approved by the controller manufacturer or a registered design professional. Notwithstanding any inconsistent provision of Chapter 1 of Title 28 of the *Administrative Code*, the work required to comply with this section may not be performed without a permit from the department.

## SECTION 3.11 EMERGENCY OPERATION AND SIGNALING DEVICES

### 3.11.1 Car emergency signaling devices.

**Delete and revise Section 3.11.1 to read as follows:**

**3.11.1 Car emergency signaling devices.** Elevators shall be provided with the following signaling devices:

- (a) In all buildings, the elevator shall be provided with an audible signaling device, operable from the emergency stop switch, when provided, and from a switch marked "ALARM" that is located in or adjacent to each car operating panel. The signaling device shall be located inside the building and audible inside the car and outside the hoistway. One signaling device may be used for a group of elevators.
- (b) In buildings in which a building attendant (building employee, watchperson, etc.) is not continuously available to take action when the required emergency signal is operated, the elevators shall be provided with a means within the car for communicating with or signaling to a service which is capable of taking appropriate action when a building attendant is not available.

### 3.11.3 Firefighters' service.

**Delete and revise Section 3.11.3 to read as follows:**

**3.11.3 Firefighters' service operation in existing elevators.**

Firefighters' service operation shall be installed in accordance with the *New York City Building Code* in all existing elevators serving any of the following:

- (a) High rise buildings or buildings classified in Occupancy Group† M except existing R-2.
- (b) All buildings or buildings classified in Occupancy Group† A, B, E, I, or R-1 (except for "residential hotels," as such term is defined by the commissioner pursuant to rules and regulations).

### SECTION 3.12

#### SUSPENSION MEANS AND THEIR CONNECTIONS

##### 3.12.1 Suspension means.

Delete Section 3.12.1 in its entirety.

### PART IV HYDRAULIC ELEVATORS

#### SECTION 4.2 MECHANICAL EQUIPMENT

##### 4.2 Delete Section 4.2 in its entirety.

##### 4.3.1 Connection to driving machine.

Delete Section 4.3.1 in its entirety.

##### 4.3.2 Plunger stops.

Delete Section 4.3.2 in its entirety.

##### 4.3.3 Hydraulic elevators.

Delete and revise Section 4.3.3 to read as follows:

**4.3.3 Hydraulic elevators.** Hydraulic elevators that have any portion of the cylinder buried in the ground and that do not have a double cylinder or a cylinder with a safety bulkhead shall comply with this section by December 14, 2014:

- (a) Have the cylinder replaced with a double cylinder or a cylinder with a safety bulkhead protected from corrosion by one or more of the following methods:
  - (1) Monitored cathodic protection;
  - (2) A coating to protect the cylinder from corrosion that will withstand the installation process;
  - (3) By a protective plastic casing immune to galvanic or electrolytic action, salt water, and other known underground conditions; or
- (b) Be provided with a device meeting the requirements of Section 3.5 or a device arranged to operate in the down direction at an overspeed not exceeding one hundred twenty-five (125) percent of rated speed. The device shall mechanically act to limit the maximum car speed to the buffer striking speed, or stop the elevator car with rated load with a deceleration not to exceed  $32.2 \text{ ft/s}^2$  ( $9.8 \text{ m/s}^2$ ), and shall not automatically reset. Actuation of the device shall cause power to be removed from the pump motor and control valves until manually reset; or

- (c) Have other means acceptable to the department to protect against unintended movement of the car as a result of uncontrolled fluid loss.

### SECTION 4.4

#### VALVES, SUPPLY PIPING, AND FITTINGS

##### 4.4 Delete Section 4.4 in its entirety.

### SECTION 4.5 TANKS

##### 4.5.2 Pressure tanks.

Delete Section 4.5.2 in its entirety.

### SECTION 4.6 TERMINAL STOPPING DEVICES

##### 4.6 Delete Section 4.6 in its entirety.

### SECTION 4.7 OPERATING DEVICES AND CONTROL EQUIPMENT

##### 4.7.1 Operating devices.

Delete Section 4.7.1 in its entirety.

##### 4.7.2 Top-of-car operating devices.

Delete Section 4.7.2 in its entirety.

##### 4.7.3 Anticreep leveling devices.

Delete Section 4.7.3 in its entirety.

##### 4.7.4 Electrical protective devices.

Delete and revise Section 4.7.4 to read as follows:

**4.7.4 Electrical protective devices.** When they apply to hydraulic elevators, the following electrical protective devices conforming to the requirements of Section 3.10.4 shall be provided:

- (a) Stop switches in the pit; and
- (b) Where such emergency doors are provided, in-car emergency exit door electric contacts.

Such devices shall prevent the operation of the elevator by the normal operating device and shall prevent the moment of the car in response to the anticreep leveling device.

##### 4.7.5 Power supply line disconnecting means.

Delete Section 4.7.5 in its entirety.

### SECTION 4.8 ADDITIONAL REQUIREMENTS FOR COUNTERWEIGHTED HYDRAULIC ELEVATORS

##### 4.8 Delete Section 4.8 in its entirety.



## SECTION 4.9 ADDITIONAL REQUIREMENTS FOR ROPED HYDRAULIC ELEVATORS

### 4.9 Delete Section 4.9 in its entirety.

## PART V ESCALATORS

### SECTION 5.1 CONSTRUCTION

Delete and revise Section 5.1.4 to read as follows:

#### 5.1.4 Antislid device.

On high deck balustrades, antislid devices shall be provided on decks or combination of decks when the outer edge of the deck is greater than 12 inches $\pm$  (305 mm) from the centerline of the handrail or on adjacent escalators when the distance between centerline of the handrails is greater than 16 inches $\pm$ . (406 mm).

These devices shall consist of raised objects fastened to the decks, not closer than 4 inches $\pm$  (102 mm) to the handrail and spaced not greater than 78 inches $\pm$  (2000 mm) apart. The height shall be not less than  $\frac{3}{4}$  inch $\pm$  (19 mm). There shall be no sharp corners or edges.

#### 5.1.7 Step risers.

Delete Section 5.1.7 in its entirety.

#### 5.1.8 Slotting of step treads.

Delete Section 5.1.8 in its entirety.

#### 5.1.11 Step/skirt performance index

Delete Section 5.1.11 in its entirety.

### SECTION 5.2 BRAKES

#### 5.2 Delete Section 5.2 in its entirety.

### SECTION 5.3 OPERATING AND SAFETY DEVICES

#### 5.3.1 Starting switches.

Delete and revise Section 5.3.1 as follows:

**5.3.1 Starting devices.** In every new and existing escalator, starting devices shall be provided with the combination of a starting switch and a starting button. The escalator shall be started only after the activation of both the switch and the button.

- (a) *Starting switch.* Starting switches shall be of continuous pressure spring return type and shall be operated by a cylinder type lock having five-pin, five-disc or five-tumbler combination. Starting switches shall be of three-position type and shall be clearly marked as follows:

**NORMAL.** A central position for the key entry and spring return position.

**START-UP.** A right side position for starting the escalator in the upward direction.

**START-DOWN.** A left side position for starting the escalator in the downward direction.

- (b) *Starting Button.* Starting buttons shall be of the constant pressure type and located within 6 in. (152 mm) from the starting switch. They shall be clearly marked “**Starting Button**”.

- (c) *Cover Plate.* A locked, transparent cover plate that can be opened by the starting key and clearly marked “For Start Only” shall protect the starting devices.

- (d) *Location of starting devices.* Starting devices shall be located at top and bottom of the escalator on the right side-facing newel.

(NOTE: The starting key shall be kept on the premises at all times and shall only be accessible to persons authorized to start escalators. It shall also be made available to the commissioner or the commissioner’s representative.)

#### 5.3.2 Emergency stop buttons.

Delete and revise Section 5.3.2 as follows:

**5.3.2 Emergency stop buttons location.** A red stop button shall be visibly located at the top and bottom landings on the right side facing the escalator. Remote stop buttons are prohibited except that any escalator connected to an automatic fire alarm system shall gradually stop not exceeding the speed of 3 ft per sec<sup>2</sup> (0.91 m/s<sup>2</sup>) upon the activation of such system.

#### 5.3.3 Speed governor.

Delete Section 5.3.3 in its entirety.

#### 5.3.4 Broken step-chain device.

Delete Section 5.3.4 in its entirety.

#### 5.3.5 Application of brake.

Delete Section 5.3.5 in its entirety.

#### 5.3.6 Broken drive-chain device.

Delete Section 5.3.6 in its entirety.

#### 5.3.7 Skirt obstruction device.

Delete and revise Section 5.3.7 as follows:

**5.3.7 Skirt obstruction device.** Escalators shall comply with the following no later than January 1, 2014: Means shall be provided to cause the electric power to be removed from the escalator driving machine motor and brake if an object becomes caught between the step and the skirt as the step approaches the upper combplate, intermediate device or lower combplate. On units having a run of 20 feet $\pm$  (6.10 m) or more, intermediate devices shall be provided on both sides of the escalator with devices located at interval of 10 feet $\pm$  (3.05 m) or less. The activation of an intermediate device shall stop the escalator at a rate not greater than 3 ft per sec<sup>2</sup> (0.91 m/s<sup>2</sup>) in the direction of travel. The upper and lower skirt devices shall be located so that the escalator will stop before that object reaches the combplate. The activation of any skirt device

shall stop the escalator with any load up to full brake rated load with the escalator running.

**Add new Section 5.3.12 to read as follows:**

**5.3.12 Comb-step stop device.** A device shall be provided that will cause the opening of the power circuit to the escalator driving machine motor and brake where a resultant vertical force not greater than 60 lbf (268 N) in the upward direction is applied at the center of the front of the comb-plate.

## **SECTION 5.5 ENTRANCE AND EGRESS ENDS**

**5.5.2 Distinction between comb and step.**

Delete Section 5.5.2 in its entirety.

**5.5.3 Adjacent floor surfaces.**

Delete Section 5.5.3 in its entirety.

**5.5.5 Landing access plates.**

Delete Section 5.5.5 in its entirety.

## **PART VI DUMBWAITERS**

Delete Part VI in its entirety.

## **PART VII HAND ELEVATORS**

**Add new Section 7.0 to read as follows:**

### **SECTION 7.0 EXISTING HAND POWERED FREIGHT ELEVATORS**

Existing hand powered freight elevators shall not be subject to the provisions of this section. However, adequate protection of landing openings shall be provided by hinged or sliding doors which shall remain locked at all times except when the freight elevator is in use. Auxiliary gates not less than 36 inches† (914 mm) in height, substantially constructed and secured in place, of wood or metal, or equivalent metal chains shall be installed. Such gates or chains may be arranged to lift vertically, to slide horizontally, or to swing. No part of any gate or chain shall project into the freight elevator shaft. Gates may be operated automatically or manually.

### **SECTION 7.1 HOISTWAY, HOISTWAY ENCLOSURES, AND RELATED CONSTRUCTION**

Delete Section 7.1 in its entirety.

### **SECTION 7.2 MACHINERY AND EQUIPMENT**

Delete Section 7.2 in its entirety.

## **PART VIII SIDEWALK ELEVATORS**

### **SECTION 8.1 HOISTWAY, HOISTWAY ENCLOSURES, AND MACHINERY ROOMS**

Delete Section 8.1 in its entirety.

### **SECTION 8.2 MACHINERY AND EQUIPMENT**

**8.2.2 Buffers and bumpers.**

Delete Section 8.2.2 in its entirety.

**8.2.3 Counterweights.**

Delete Section 8.2.3 in its entirety.

**8.2.4 Car frames and platforms.**

Delete Section 8.2.4 in its entirety.

**8.2.5 Bow-irons and stanchions.**

Delete Section 8.2.5 in its entirety.

**8.2.6 Car enclosures and car doors and gates.**

Delete Section 8.2.6 in its entirety.

**8.2.7 Car and counterweight safeties and governors.**

Delete Section 8.2.7 in its entirety.

**8.2.8 Capacity and loading.**

Delete Section 8.2.8 in its entirety.

**8.2.9 Driving machines and sheaves.**

Delete Section 8.2.9 in its entirety.

**8.2.10 Terminal stopping devices.**

Delete Section 8.2.10 in its entirety.

**8.2.11 Locking devices for hinged swinging doors or vertically lifting covers in sidewalks or other areas exterior to the building.**

Delete Section 8.2.11 in its entirety.

**8.2.12 Requirements for electrical wiring and electrical equipment.**

Delete Section 8.2.12 in its entirety.

**8.2.13 Clearance between loading side of car platforms and hoistway enclosures.**

Delete Section 8.2.13 in its entirety.

**8.2.14 Operating devices and control equipment of sidewalk elevator.**

Delete and revise Section 8.2.14 as follows:

**8.2.14 Operating devices and control equipment of sidewalk elevator.** The operation of power sidewalk elevators through openings in the sidewalk, or through openings in other exterior areas that are accessible to the public, and that are protected by hinged doors or vertically lifting covers, shall conform to the following:

- (a) The elevator shall be operated in both the up and down directions through the opening, only from the sidewalk or other exterior area. The operation shall be by means of:
  - (1) Key-operated continuous-pressure-type up and down switches; or
  - (2) Continuous-pressure-type up-and-down operating buttons on the free end of a detachable, flexible cord 5 feet± (1.52 m) or less in length.
- (b) Key-operated switches shall be of continuous pressure spring return type, and shall be operated by a cylinder-type lock having not less than a five-pin or five-disk combination with the key removable only when the switch is in the "OFF" position.
- (c) Key-operated switches and plug receptacles for flexible cords shall be mounted in weatherproof boxes with covers installed above the sidewalk or other area on the side of the building wall, located 18 inches± (457 mm) or less horizontally from one side of the opening.
- (d) Operating buttons may be provided in the elevator car and at any landing below the top landing, provided that such buttons shall operate the car only when the bow-iron or stanchions are not in contact with the doors or covers in the sidewalk or other exterior area.
- (e) When the bow-iron or stanchions are in contact with the doors or covers at the sidewalk or other exterior area, it shall be possible to operate the car only by means of either the key switches or the continuous-pressure type up-and-down buttons on the free end of the flexible cord specified in Section 8.2.14(a)(1).
- (f) Flexible cords and operating keys shall not be left where they are accessible to unauthorized persons for operation of the elevator.

## PART IX MOVING WALKS

Add new Section 9.0 to read as follows:

### SECTION 9.0 SKIRT PANELS

- (a) The clearance on each side of the steps between step thread and the adjacent skirt panel shall be not more than 0.188 inch±. (4.8 mm) and the edges shall be rounded.
- (b) The exposed surface of the skirt panels adjacent to the thread shall be smooth.

### SECTION 9.1 PROTECTION OF FLOOR OPENINGS

Delete Section 9.1 in its entirety.

### SECTION 9.2 PROTECTION OF SUPPORTS AND MACHINE SPACES AGAINST FIRE

Delete Section 9.2 in its entirety.

### SECTION 9.3 CONSTRUCTION REQUIREMENTS

Delete Section 9.3 in its entirety.

### SECTION 9.4 ENTRANCE AND EGRESS ENDS

#### 9.4.2 Distinction between comb and step.

Delete Section 9.4.2 in its entirety.

### SECTION 9.5 DRIVING MACHINES, MOTOR, AND BRAKE

Delete Section 9.5 in its entirety.

### SECTION 9.6 OPERATING AND SAFETY DEVICES

#### 9.6.1 General.

Delete Section 9.6.1 in its entirety.

#### 9.6.2 Starting switch.

Delete and revise Section 9.6.2 to read as follows:

**9.6.2 Starting devices.** In every new and existing moving walk, starting devices shall be provided with the combination of a starting switch and a starting button. The escalator shall be started only after the activation of both the switch and the button.

- (a) *Starting Switch.* Starting switches shall be of continuous pressure spring return type and shall be operated by a cylinder type lock having five-pin, five-disc or five-tumbler combination. Starting switches shall be of three-position type and shall be clearly marked as follows:

**NORMAL.** A central position for the key entry and spring return position.

**START-UP.** A right side position for starting the escalator in the upward direction.

**START-DOWN.** A left side position for starting the escalator in the downward direction.

- (b) *Starting Button.* Starting buttons shall be of the constant pressure type and located within 6 inches± (152 mm) from the starting switch. They shall be clearly marked "**Starting Button**".
- (c) *Cover Plate.* A locked, transparent cover plate that can be opened by the starting key and clearly marked "**For Start Only**" shall protect the starting devices.

- (d) *Location of starting devices.* Starting devices shall be located at top and bottom of the escalator on the right side-facing newel.

(NOTE: The starting key shall be kept on the premises at all times and may only be accessible to persons authorized to start escalators. It shall also be made available to the commissioner or the commissioner's representative.)

### 9.6.3 Emergency stop buttons.

Delete and revise Section 9.6.3 to read as follows:

**9.6.3 Emergency stop buttons location.** A red stop button shall be visibly located at the top and bottom landings on the right side facing the moving walk. Remote stop buttons are prohibited except that any escalator connected to an automatic fire alarm system shall gradually stop not exceeding the speed of 3 ft per sec<sup>2</sup> (0.91 m/s<sup>2</sup>) upon the activation of such system.

### 9.6.4 Speed governor.

Delete Section 9.6.4 in its entirety.

### 9.6.5 Application of an electrically released brake.

Delete Section 9.6.5 in its entirety.

### 9.6.6 Broken drive-chain switch.

Delete Section 9.6.6 in its entirety.

### 9.6.10 Disconnected motor safety device.

Delete Section 9.6.10 in its entirety.

Add new Section 9.6.12 to read as follows:

**9.6.12 Comb-pallet stop device.** A device shall be provided that will cause the opening of the power circuit to the moving walk driving-machine motor and brake when a resultant vertical force not greater than 60 lbf (268 N) in the upward direction is applied at the center of the front of the comb-plate.

## SECTION 9.7 LIGHTING AND ACCESS

### 9.7.2 Access to Interior.

Delete Section 9.7.2 in its entirety.

## PART X PRIVATE RESIDENCE ELEVATORS

### 10 Delete Section 10 in its entirety.

## CHAPTER K4 MODIFICATIONS TO ASME A17.1S-2005 SAFETY CODE FOR MACHINE-ROOM-LESS ("MRL") ELEVATORS

**K401.1 General.** The provisions of American Society of Mechanical Engineers ("ASME") A17.1S-2005 must be modified in accordance with this chapter. The section numbers correlate to those in the referenced ASME standard.

## PART 1 GENERAL

### SECTION 1.1 SCOPE

#### 1.1 Delete and revise Section 1.1 to read as follows:

See ASME A17.1-2000 including A17.1a-2002 and A17.1b-2003 as amended by Chapter K1 of Appendix K of the *New York City Building Code* for additional, relevant requirements.

### SECTION 1.3 DEFINITIONS

#### 1.3 Delete and revise the definition "Control space, elevator, dumbwaiter, material lift" to read as follows:

**CONTROL SPACE, ELEVATOR, DUMBWAITER, MATERIAL LIFT:** a space outside the hoistway, intended for full bodily entry, which contains the motor controller. The space could also contain electrical and/or mechanical equipment used directly in connection with the elevator, dumbwaiter, or material lift, but not the electric driving machine or the hydraulic machine. (See Appendix Q of ASME A17.1S as amended by Chapter K4 of the *New York City Building Code*.)

Add the following sentence to the end of the definition "Machinery space, elevator, dumbwaiter, material lift":

Machinery space in hoistways may not contain a motion controller, a motor controller or an operation controller.

## PART 2 ELECTRIC ELEVATORS

### SECTION 2.1 CONSTRUCTION OF HOISTWAYS AND HOISTWAY ENCLOSURES

#### 2.1.4 Control of smoke and hot gases.

Delete and revise Section 2.1.4 to read as follows:

**2.1.4 Control of smoke and hot gases.** Hoistways must be provided with means to prevent the accumulation of smoke and hot gases when required by the *New York City Building Code*.

**2.1.6 Projections, recesses and setbacks in hoistway enclosures.**

Delete and revise Section 2.1.6.2 to read as follows:

**2.1.6.2** On sides not used for loading and unloading:

- (a) Recesses, except those necessary for installation of elevator equipment, must not be permitted;
- (b) Beams, floor slabs, or other building construction making an angle less than 75 degrees with the horizontal must not project more than 50 mm (2 in.)



inside the hoistway enclosure unless the top surface of the projection is beveled at an angle not less than 75 degrees with the horizontal;

- (c) Separator beams between adjacent elevators are not required to have bevels;
- (d) Where setbacks exceeding 50 mm (2 in.) occur in the enclosure wall, the top of the setback must be beveled at an angle of not less than 85 degrees with the horizontal;
- (e) Bevels are not required if the projections and setbacks are covered with material conforming to the following:
  - (1) It must be equal to or stronger than 1.110 mm (0.0437 in.) wire;
  - (2) It must have openings not exceeding 25 mm (1 in.);
  - (3) It must be supported and braced such that it will not deflect more than 25 mm (1 in.) when subjected to a force of 4.79 kPa (100 lbs. per sq ft) applied horizontally at any point.

## SECTION 2.2 PITS

### 2.2.2 Design and construction of pits.

**Delete and revise Section 2.2.2.5 to read as follows:**

**2.2.2.5** Elevators with sprinklers in the shaftway must be provided with a drain or sump pump.

### 2.2.4 Access to pits.

**Delete and revise Section 2.2.4.1 to read as follows:**

**2.2.4.1** Access must be by means of the lowest hoistway door or by means of a separate pit access door, located at the level of the pit floor.

**Add new Subsection (f) to Section 2.2.4.4 to read as follows:**

- (f) Pit doors must be labeled “DANGER: ELEVATOR PIT” with letters not less than 51 mm (2 in.) high.

## SECTION 2.7 MACHINERY SPACES, MACHINE ROOMS, CONTROL SPACES, AND CONTROL ROOMS

### 2.7.3 Access to machinery spaces, machine rooms, control spaces, and control rooms.

**Add new Subsection (d) to Section 2.7.3.1.1 to read as follows:**

- (d) A control space and machinery space for elevators must only be located where working clearances required for the control space will not impede upon the path of travel in unrestricted areas. Where the elevator control space is located in a path of travel in an unrestricted area, a clear path of travel parallel to the control space must not be less than the required working clearance plus 1219 mm (48 in.) perpendicular to

the control space. A permanent barricade needed to establish the working clearances for the control space must be accessible to elevator personnel from the control space. The barricade must be deployed whenever the doors to the control space are in the open position. See Figure Q-2.

**Add new Subsection (d) to Section 2.7.3.4.1 to read as follows:**

- (d) Labeled “ELEVATOR EQUIPMENT” with letters not less than 51 mm (2 in.) high.

**Delete and revise the first sentence of Section 2.7.3.4.2 to read as follows:**

Access doors to machine rooms, control rooms and control spaces must be provided.

**Add new Subsection (d) to Section 2.7.3.4.6 to read as follows:**

- (d) Labeled “DANGER: ELEVATOR HOISTWAY” with letters not less than 51 mm (2 in.) high and have an electrical safety switch that will remove power from the hoist machine and brake if the door is opened.

### 2.7.6 Location of machinery spaces, machine rooms, control spaces, control rooms, and equipment.

**Delete and revise Section 2.7.6.2 to read as follows:**

**2.7.6.2 Location of machinery spaces and control spaces.** Machinery spaces may be located inside or outside the hoistway. Control spaces are not permitted inside the hoistway. Control spaces are only permitted inside the building.

**Delete and revise Section 2.7.6.3.4 to read as follows:**

**2.7.6.3.4** Where a governor is located inside the hoistway, means of access conforming to the requirements of Sections 2.7.3.3 and 2.7.3.4 for inspection and servicing the governor must be provided from outside the hoistway.

**Add new sentence to the end of Section 2.7.6.4 to read as follows:**

These means must be permanently installed.

**Delete and revise Subsection (d) of Section 2.7.6.4.3 to read as follows:**

- (d) If the car is moved manually, the effort required to move the car in the direction of load imbalance must not exceed 400 N (90 lbf). If the means used is removable, it must be stored outside the hoistway and access to the means must be with a key that is Group 1 Security. It must be suitably marked to indicate the machine for which it is intended. It must also contain instructions on its use and be labeled “Machine Brake Release”.

## SECTION 2.8 EQUIPMENT IN HOISTWAYS, MACHINERY SPACES, MACHINE ROOMS, CONTROL SPACES, AND CONTROL ROOMS

### 2.8.3 Pipes, ducts, tanks, and sprinklers.

**Delete and revise Section 2.8.3.3 to read as follows:**

**2.8.3.3** Sprinkler systems conforming to NFPA 13 must be permitted to be installed in the hoistway or machinery space, subject to Sections 2.8.3.3.1 through 2.8.3.3.4.

## **SECTION 2.11 PROTECTION OF HOISTWAY OPENINGS**

**2.11.1 Entrances and emergency doors required.**

**Delete and revise the last sentence of Section 2.11.1.1 to read as follows:**

Entrances must be at least 2030 mm (80 in.) in height and 915 mm (36 in.) in width.

**Delete and revise Subsection (a) of Section 2.11.1.2 to read as follows:**

- (a) The clear opening must be at least 915 mm (36 in.) wide and 2030 mm (80 in.) high.

**2.11.2 Types of entrances.**

**Delete Subsection (c) of Section 2.11.2.1 in its entirety.**

**Delete Subsection (c) of Section 2.11.2.2 in its entirety.**

**2.11.6 Openings of hoistway doors.**

**Delete and revise Subsection (d) of Section 2.11.6.2 to read as follows:**

- (d) Any landing for elevator equipped with Phase II Emergency In-Car Operation when Phase II is effective.

**Add new Subsection (e) to Section 2.11.6.2 to read as follows:**

- (e) Consecutive vacant floors.

**Add new Subsection (f) to Section 2.11.6.2 to read as follows:**

- (f) Main lobby street floor.

**Add new Section 2.11.6.5 to read as follows:**

**2.11.6.5 Vestibule.**

**2.11.6.5.1** Elevator landings provided with a zero clearance vestibule (not to exceed 150 mm (6 in.) from the elevator hoistway door) are permissible only when locking devices accessible from the car are installed exclusively on the door that separates the zero clearance vestibule from the occupied floor space.

**2.11.6.5.2** Where the vestibule is not a zero clearance vestibule as defined in Section 2.11.6.5.1, locking devices at the vestibule will be permitted under any one of the following conditions:

- (a) A red telephone is installed in the vestibule near the elevator doors to communicate with lobby fire command station or building manager's office or to central service station when the building is not attended. A sign must be posted near the telephone. The sign must read "In Case of Fire or Other Emergency Use This Phone to Contact Lobby or Building Manager or Central Service Station";

- (b) The locking devices on the vestibule door leading to an exit are released upon activation of any detection or signaling devices, or power failure;

- (c) At least one exit stair is located within the vestibule.

**2.11.7 Glass in hoistway doors.**

**Delete and revise Section 2.11.7.1 to read as follows:**

**2.11.7.1 Vision panels.** For elevators with automatic or continuous-pressure operation, manually operated or self-closing hoistway doors of the vertically or horizontally sliding type must be provided with a vision panel. In multi-section doors, the vision panel is required in one section only, but is permitted to be placed in all sections. All horizontally swinging elevator doors must be provided with vision panels. Vision panels are permitted for any type of hoistway door. Vision panels are not required at the landing of automatic operation elevators equipped with horizontally sliding car and hoistway doors.

Where required or used, vision panels must conform to Sections 2.11.7.1.1 through 2.11.7.1.7.

**Delete and revise Section 2.11.7.1.1 to read as follows:**

**2.11.7.1.1** The area of any single vision panel must not be less than 0.008 m<sup>2</sup> (12 in<sup>2</sup>), and the total area of one or more panels in any hoistway door must not be more than 0.026 m<sup>2</sup> (40 in<sup>2</sup>).

**2.11.11 Entrances, horizontal slide type.**

**Delete and revise Subsection (a) of Section 2.11.11.6 to read as follows:**

- (a) The bottom of each panel must be guided by two or more members.

**2.11.15 Marking.**

**Delete and revise Section 2.11.15.1 to read as follows:**

**2.11.15.1 Labeling of tested assembly.** Sections 2.11.15.1.1 and 2.11.15.1.2 apply. Where required by the *New York City Building Code*, the entire entrance assembly must be of an approved type.

## **SECTION 2.12 HOISTWAY DOOR LOCKING DEVICES AND ELECTRIC CONTACTS, AND HOISTWAY ACCESS SWITCHES**

**2.12.3 Hoistway door combination mechanical locks and electrical contacts.**

**Delete Section 2.12.3 in its entirety.**

**2.12.4 Listing/certification door locking devices and door or gate electrical contacts.**

**Delete and replace Section 2.12.4.1 to read as follows:**

**2.12.4.1 Type tests.** Each type and make of hoistway-door interlock, electric contact, and door or gate electric contact must be of an approved type. Hoistway-door combination mechanical locks and electrical contacts are not permitted.

Delete and revise Subsection (b) of Section 2.12.4.3 to read as follows:

- (b) *Identification marking.* The approved agency's name, date of approval and identifying number or symbol.

#### 2.12.7 Hoistway access switches.

Delete and revise Section 2.12.7.3.2 to read as follows:

- 2.12.7.3.2 The car cannot be operated at a speed greater than 0.35 m/s (75 ft/min).

### SECTION 2.13 POWER OPERATION OF HOISTWAY DOORS AND CAR DOORS

#### 2.13.2 Power opening.

Delete and revise Section 2.13.2.1.2 to read as follows:

- 2.13.2.1.2 Collapsible car gates must not be power opened.

### SECTION 2.14 CAR ENCLOSURES, CAR DOORS AND GATES, AND CAR ILLUMINATION

#### 2.14.2 Passenger car enclosures.

Delete and revise Section 2.14.2.1.1 to read as follows:

- 2.14.2.1.1 Materials in their end use configuration, other than those covered by Sections 2.14.2.1.2 through 2.14.2.1.6, must conform to the following requirements, based on the tests conducted in accordance with the requirements of ASTM E 84, UL 723, or NFPA 255:

- (a) Flame spread rating of 0 to 50.
- (b) Smoke development of 0 to 100.

#### 2.14.7 Illumination of cars and lighting fixtures.

Delete and revise Section 2.14.7.1.4 to read as follows:

- 2.14.7.1.4 Each elevator must be provided with a guarded electric light and convenience outlet fixture on the car top and under the car platform.

### SECTION 2.18 SPEED GOVERNORS

#### 2.18.4 Speed-governor overspeed switch.

Add a new paragraph at the end of the main paragraph of Section 2.18.4.4 to read as follows:

An access door is required when the governor is installed at the top of the hoistway for access to reset switches by elevator personnel. The access door must comply with Section 2.7.3.4.6.

Delete and revise the Note to Section 2.18.4.4 to read as follows:

**NOTE:** Manual reset is defined here as personal intervention by elevator personnel at the governor.

#### 2.18.5 Governor ropes.

Delete and revise Section 2.18.5.1 to read as follows:

- 2.18.5.1 **Material and factor of safety.** Governor ropes must be a minimum of 6 mm (0.25 in.) and must comply with ASME A17.6-2010, Part 1 and ASME A17.1-2010 as referred to in ASME A17.6-2010.

### SECTION 2.20 SUSPENSION ROPES AND THEIR CONNECTIONS

#### 2.20.3 Factor of safety.

Delete and revise Section 2.20.3 to read as follows:

- 2.20.3 **Factor of safety.** Suspension ropes must be stranded carbon steel wire ropes (minimum 8 mm (0.3 in.)) or noncircular elastomeric coated steel suspension members. They must comply with ASME A17.6-2010, Part 1 and Part 3 and ASME A17.1-2010 as referred to in A17.6-2010. Aramid fiber ropes are not permitted.

#### 2.20.4 Minimum number and diameter of suspension ropes.

Delete and revise Section 2.20.4 to read as follows:

- 2.20.4 **Minimum number and diameter of suspension ropes.** Suspension ropes must be stranded carbon steel wire ropes (minimum 8 mm (0.3 in.)) or noncircular elastomeric coated steel suspension members. They must comply with ASME A17.6-2010, Part 1 and Part 3 and ASME A17.1-2010 as referred to in A17.6-2010. Aramid fiber ropes are not permitted.

### SECTION 2.24 DRIVING MACHINES AND SHEAVES

#### 2.24.10 Means for inspection of gears.

Delete and revise Section 2.24.10 to read as follows:

- 2.24.10 **Means for inspection of gears.** Each gear case of geared machines must have access to permit inspection of the contact surfaces of the gears.

### SECTION 2.25 TERMINAL STOPPING DEVICES

#### 2.25.3 Final terminal stopping devices.

Add a new Subsection (d) to Section 2.25.3.1 to read as follows:

- (d) Final limit switches and bracket must be permanently secured and pinned.

### SECTION 2.26 OPERATING DEVICES AND CONTROL EQUIPMENT

#### 2.26.1 Operation and operating devices.

Delete and revise Subsection (e) of Section 2.26.1.4.2 as follows:

- (e) The inspection operating devices (see Section 2.26.1.4.1(c)) must be portable, with a cord length of

the distance from the connection point to the farthest corner of the top of car, provided that

- (1) The “ENABLE” device (see Section 2.26.1.4.2(c)), and a stop switch, in addition to the stop switch required in Section 2.26.1.4.2(a) are included in the portable unit; and
- (2) The flexible cord is permanently attached so that the portable unit cannot be detached from the car top.

## **2.26.2 Electrical protective devices.**

**Delete and revise Section 2.26.2.5 to read as follows:**

**2.26.2.5 Emergency stop switch.** On all elevators, an emergency stop switch must be provided in the car, and located in or adjacent to each car operating panel. When open (“STOP” position), this switch must cause the electric power to be removed from the elevator driving-machine motor and brake. Emergency stop switches must:

- (a) Be of the manually opened and closed type;
- (b) Have red operating handles or buttons;
- (c) Be conspicuously and permanently marked “STOP” and must indicate the “STOP” and “RUN” positions; and
- (d) While opened, cause the audible device to sound (see Section 2.27.1.2).

**Delete Section 2.26.2.21 in its entirety.**

**Delete Section 2.26.2.33 in its entirety.**

## **SECTION 2.27 EMERGENCY OPERATION AND SIGNALING DEVICES**

### **2.27.1 Car emergency signaling devices.**

**Delete and revise Section 2.27.1.1.1 to read as follows:**

**2.27.1.1.1** A two-way communications means between the car and a location in the building that is readily accessible to authorized and emergency personnel must be provided. Means must be provided to enable two-way voice communication between the machine, the control room, the control space and the interior of the car.

### **2.27.2 Emergency or standby power system.**

**Delete and revise Section 2.27.2.4.3 to read as follows:**

**2.27.2.4.3** Means must be provided adjacent to the selector switch(es) to indicate that the elevator is at the designated level with the doors in the normally open position.

### **2.27.3 Firefighters’ emergency operation: automatic elevators.**

**Delete and revise Section 2.27.3 to read as follows:**

**2.27.3 Firefighters’ emergency operation: automatic elevators.** See Chapter K1 of Appendix K of the *New York City Building Code*, and replace the words “machine room” with “control room and control space”.

### **2.27.4 Firefighters’ emergency operation: nonautomatic elevators.**

**Delete and revise Section 2.27.4 to read as follows:**

**2.27.4 Firefighters’ emergency operation: nonautomatic elevators.** See Chapter K1 of Appendix K of the *New York City Building Code*.

### **2.27.5 Firefighters’ emergency operation: automatic elevators with designated-attendant operation.**

**Delete and revise Section 2.27.5 to read as follows:**

**2.27.5 Firefighters’ emergency operation: automatic elevators with designated attendant operation.** See Chapter K1 of Appendix K of the *New York City Building Code*.

### **2.27.8 Switch keys.**

**Delete and revise Section 2.27.8 to read as follows:**

**2.27.8 Switch keys.** See Chapter K1 of Appendix K of the *New York City Building Code*.

### **2.27.9 Elevator corridor call station pictograph.**

**Delete Section 2.27.9 in its entirety.**

## **SECTION 2.29 IDENTIFICATION**

### **2.29.1 Identification of equipment.**

**Delete and revise Section 2.29.1 to read as follows:**

**2.29.1 Identification of equipment.** In buildings with more than one (1) elevator, each elevator must be assigned a unique alphabetical or numerical identification, a minimum of 50 mm (2 in.) in height. The identification number must be applied to the following locations:

- (a) Driving machine;
- (b) MG and/or transformers;
- (c) Controller;
- (d) Selector;
- (e) Governor;
- (f) Main line disconnect switch;
- (g) The crosshead or, where there is no crosshead, the car frame, such that it is visible from the top of the car;
- (h) The car operating panel, minimum of 13 mm (0.5 in.) in height;
- (i) Adjacent to or on every elevator entrance at the designated level, minimum of 75 mm (3 in.) height; and
- (j) Each bank of elevators must be identified by a letter.

**Add new Section 2.29.1.1 to read as follows:**

**2.29.1.1 New York City identification number.** Each elevator must be assigned a unique numerical identification a minimum of 6 mm (0.25 in.) in height. The city identification number must be applied to the following locations:

- (a) The driving machine;



- (b) MG and / or transformers;
- (c) Controller;
- (d) Main line disconnect switch;
- (e) The crosshead or, where there is no crosshead, the car frame, such that it is visible from the top of the car;
- (f) The car operating panel (main panel only).

Add new Section 2.29.3 to read as follows:

**2.29.3 Main line location signage.** A permanent sign must be located on or adjacent to the Phase I key switch. The sign must indicate the location of the mainline disconnect switches for that bank of elevators. Lettering must be a minimum of 6 mm (0.25 in.) high in red or a color contrasting with a red background.

### PART 3 HYDRAULIC ELEVATORS

#### SECTION 3.6 PROTECTION OF SPACES BELOW HOISTWAY

##### 3.6.2 Counterweight safety actuation.

Delete and revise Section 3.6.2 to read as follows:

**3.6.2 Car and counterweight safety actuation.** Where the space referred to in Section 3.6 falls underneath the car or counterweight and/or its guides, the car and counterweight must be provided with a safety device.

#### SECTION 3.7 MACHINERY SPACES, MACHINE ROOMS, CONTROL SPACES, AND CONTROL ROOMS

Delete and revise the opening paragraph of Section 3.7.1 to read as follows:

**3.7.1** Machinery spaces, machine rooms, control spaces, and control rooms must conform to the requirements of Sections 2.7.1 through 2.7.7 and Section 2.7.9. Hydraulic machines and controllers are not permitted in the hoistway or pit.

### PART 8 GENERAL REQUIREMENTS

#### SECTION 8.1 SECURITY

##### 8.1.2 Group 1: Restricted.

Add new Subsection (w) to Section 8.1.2 to read as follows:

- (w) The requirements of Section 2.14.1.10 (side emergency exit doors) apply.

#### NONMANDATORY APPENDIX Q EXPLANATORY FIGURES FOR THE DEFINITIONS OF ELEVATOR MACHINERY SPACE, MACHINE ROOM, CONTROL SPACE, CONTROL ROOM, REMOTE MACHINE ROOM, OR REMOTE CONTROL ROOM

Delete and replace Figure Q-2 with the following new Figure Q-2:

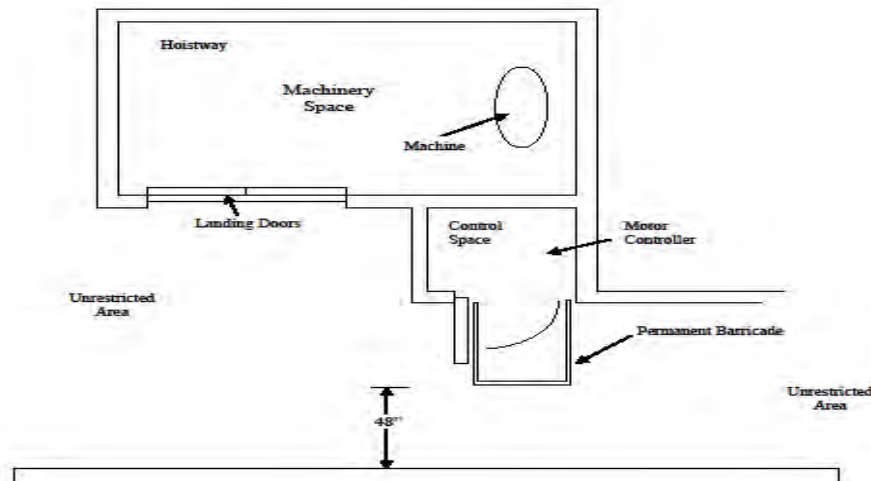


Figure Q-2

# APPENDIX L RESERVED

NYC



[illegible]

two independently supported load-bearing stud walls. See Figure M103.1.

2. Such wall shall be continuous between foundations and roofs.

3. When roof construction on the same level is combustible on both sides of the party wall, the party wall shall extend through the roof construction to a height of at least 4 inches (102 mm) above the high point of the roof framing unless a minimum of 18 inches (457 mm) of non-combustible roof construction is provided on each side of the party wall.

4. Such party wall shall be made smoke tight at junctions with exterior walls. In buildings in construction Type VA and VB, exterior walls shall be constructed of non-combustible materials for a distance of at least 18 inches (457 mm) on each side of the party wall, or the party wall shall project at least 12 inches (305 mm) through the exterior wall.

**DWELLING, TWO-FAMILY.** Any building or structure designed and occupied exclusively for residence purposes on a long-term basis for more than a month at a time by not more than two families. Two-family dwellings shall also be deemed to include a dwelling located in a series of two-family dwellings each of which faces or is accessible to a legal street or public thoroughfare, provided that each such dwelling is equipped as a separate dwelling with all essential services, and also provided that each such dwelling is arranged so that it may be approved as a legal two-family dwelling.

**M103.1 General.** A fire wall shall be provided between buildings in accordance with Chapter 7 of this code. However, multiple one- and two-family dwellings of construction Type IIIA, IIIB, VA and VB where permitted, not more than three stories in height, and not more than 2,100 square feet (195 m<sup>2</sup>) on a story may be separated by party walls constructed in accordance with the following and as illustrated in Figures M103(1) and M103(2):

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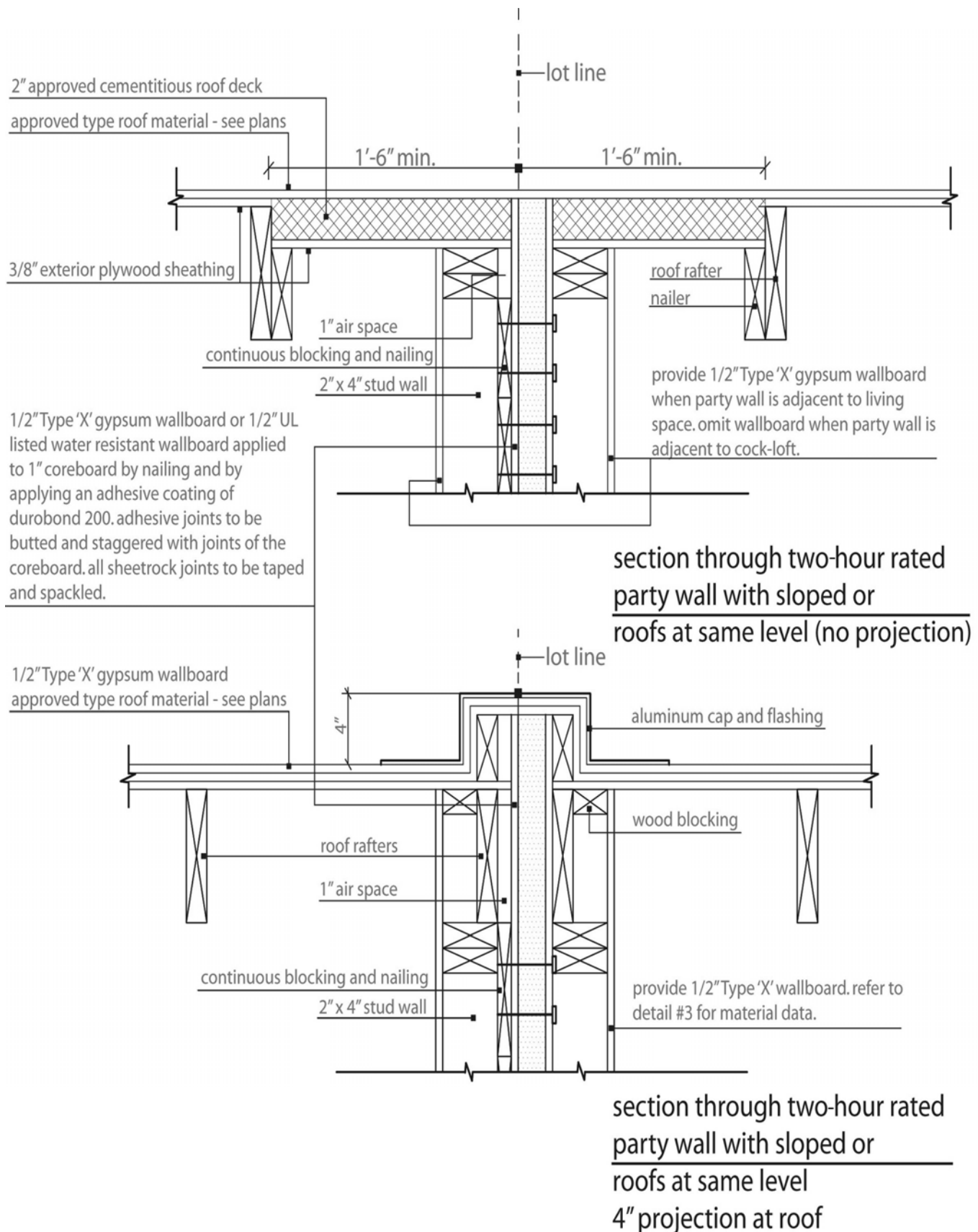


FIGURE M103(1)  
PARTY WALL VERTICAL SECTION

General construction notes. All other conditions remain the same.

lot line

1'-6"

1'-6"

1/2" type 'x' gypsum wallboard or 1/2" UL listed water resistant wallboard applied to 1" coreboard by nailing and by applying an adhesive coating of durobond 200. adhesive joints to be butted and staggered with joints of the coreboard. all sheetrock joints to be taped and spackled.

3/8" plywood sheathing

combustible finishes

noncombustible finishes - redwood, aluminum siding, cement stucco, etc.

2"x4" studs staggered each side with 1/2" wallboard nailed to each side

1" air space

3 1/2" fiberglass insulation (R-15)

1/2" type 'x' gypsum wallboard

3/8" plywood sheathing

combustible finishes

noncombustible finishes - redwood, aluminum siding, cement stucco, etc.

1/2" water resistant gypsum wallboard

12"

combustible finishes

noncombustible finishes - redwood, aluminum siding, cement stucco, etc.

plan of two-hour party wall with and without projection through exterior facade.

2014 NEW YORK CITY BUILDING CODE



## APPENDIX N

# ASSISTIVE LISTENING SYSTEMS PERFORMANCE STANDARDS

### SECTION BC N101 GENERAL

**N101.1 Scope.** The provisions of this appendix shall control the performance standards of assistive listening systems (ALS).

### SECTION BC N102 INDUCTION LOOP SYSTEM

#### N102.1 Induction loop system specifications.

1. If the ambient electromagnetic noise (generally caused by lighting regulation systems or major power supplies) produces a field strength exceeding 30 mA/meter at frequencies that would decrease the signal-to-noise ratio specified in Item 4, then it is recommended that, unless the noise can be reduced, an induction loop system not be considered.
2. If the electromagnetic signal produced by a nearby induction loop system spills over into a new user area being considered for a different induction loop system and produces an average magnetic field strength exceeding 15 mA/meter, then it is recommended that, unless the use of each system can be scheduled so as not to occur simultaneously, an induction loop system not be considered in the new area.
3. Given an input signal to the amplifier that has a constant level over a minimum frequency range of 100 Hz to 8,000 Hz, the measured frequency response of the magnetic field generated by the induction loop system over that range shall not vary by more than  $\pm 3$  decibels from the value at 1,000 Hz. In actual usage, graphic equalization of the output signal is allowed.
4. Given an output power level equal to the average value specified in Item 6, the minimum signal-to-noise ratio of the program signal carried by the electromagnetic field shall be at least 30 decibels.
5. Given a 1,000 Hz input signal to the amplifier that has a level sufficient to produce the minimum signal-to-noise ratio specified in Item 4, the harmonic distortion between the input signal and the program signal carried by the electromagnetic field shall not vary by more than 5 percent over the field strength range specified in Item 6.
6. Given a 1,000 Hz sinusoidal input signal, at a level equal to the long-time average level of a speech signal, the average value of the magnetic field strength generated within the user area by the loop shall equal 100 mA/meter  $\pm 3$  decibels. The maximum value of the magnetic field strength for a system set to the above recommended average value shall be 400 mA/meter (derived on the basis that the difference of the

maximum short-time average level between a speech signal approximately 0.125 seconds and the long-time average level is approximately 12 decibels). Both measurements shall be made 48 inches (1219 mm) above floor level at any point within the user area.

7. If a hand-held receiver with earphone(s) is used, the specifications in Items 3, 4 and 5 shall apply. Additionally, the sound pressure level generated by the receiver and earphone(s) shall be at least 80 decibels. The maximum high-frequency average sound pressure level generated by the receiver earphone(s) shall not exceed 130 decibels.
8. The system must have inputs capable of accepting signals at line level and microphone level and must be capable of interfacing with existing public address systems or stand-alone.
9. Any stand-alone devices powered by 110–120 volt AC used as part of the system must have been tested by an approved laboratory.
10. All input and output wiring must comply with the *New York City Electrical Code*.
11. The installation of all stand-alone components of the system must comply with the *New York City Electrical Code*.

### SECTION BC N103 INFRA-RED SYSTEM

#### N103.1 Infra-red system specifications.

1. If the ambient infra-red light (generally caused by other infra-red light-generating devices or direct sunlight) produces interference, it is recommended that, unless the interfering infra-red light can be reduced, infra-red systems not be considered.
2. Given an input signal to the transmitter at the levels specified in Item 6 over a minimum frequency range of 200 Hz to 8,000 Hz, the measured frequency response of the output signal generated by the receiver and transducer over that range shall not vary by more than  $\pm 5$  decibels from the value at 1,000 Hz. In actual usage, graphic equalization of the output signal is allowed.
3. Given an input signal to the transmitter at the levels specified in Item 6, the minimum signal-to-noise ratio of the output generated by the receiver and transducer shall be 35 decibels at all frequencies specified in Item 2.
4. Given an input signal of 1,000 Hz to the transmitter at a level sufficient to produce the minimum signal-to-noise ratio specified in Item 3, the harmonic distortion



produced by the receiver and transducer shall not be more than 5 percent.

5. Given a 1,000 Hz sinusoidal input signal at the levels specified in Item 6, the following are the possible transducers:
  - 5.1. If using a neckloop as an output transducer, generate a magnetic field strength of at least 150 mA/meter. The peak field strength shall not exceed 600 mA/meter. Measurements shall be made at the geometric center of the plane of the neckloop.
  - 5.2. If using a silhouette as an output transducer, generate a magnetic field strength of at least 50 mA/meter (the peak field strength shall not exceed 200 mA/meter). Measurements shall be made at a distance of 10 centimeters from the silhouette.
  - 5.3. If using a miniature earphone as an output transducer, generate a sound pressure level of at least 80 decibels. The maximum high-frequency average sound pressure level shall not exceed 130 decibels.
  - 5.4. If a direct input cable is used between the output of the receiver and the input of a hearing aid boot or shoe, generate a minimum voltage range of 2 mV to 800 mV and match a boot/shoe input impedance of 50 ohms or greater. The plugs at either end shall be molded 2-pin, 3-pin and/or 3.5-millimeter mini-plug (stereo or mono).
6. The system must have inputs capable of accepting signals at line level and microphone level and must be capable of interfacing with existing public address systems or stand-alone.
7. The minimum light level of the transmitted infra-red carrier signal must be sufficient so that a receiver can produce the specifications in Items 2, 3, 4 and 5 at any point within the user area.
8. Any stand-alone devices powered by 110–120 volt AC used as part of the system must be tested by an approved laboratory.
9. All input wiring must comply with the *New York City Electrical Code*.
10. The installation of all stand-alone components of the system must comply with the *New York City Electrical Code*.

## SECTION BC N104 FM SYSTEM

### N104.1 FM system specifications.

1. If an ambient FM signal (generally caused by other agencies on the same frequency or major power supplies) produces interference, it is recommended that,

unless the frequency can be changed, an FM system not be considered.

2. Given an input signal to the transmitter at the levels specified in Item 6 over a minimum frequency range of 100 Hz to 8,000 Hz, the measured frequency response of the output signal generated by the receiver and a transducer over that range shall not vary by more than +/- 5 decibels from the value at 1,000 Hz. In actual usage, graphic equalization of the output signal is allowed.
3. Given an input signal to the transmitter at the levels specified in Item 6, the minimum signal-to-noise ratio of the output generated by the receiver and transducer shall be 35 decibels at all frequencies specified in Item 2.
4. Given an input signal to the transmitter at 1,000Hz. at a level sufficient to produce the minimum signal-to-noise ratio specified in Item 3, the total harmonic distortion between the input signal and the program signal produced by the receiver and transducer shall not be more than 10 percent.
5. Given a 1,000 Hz. sinusoidal input signal at the levels specified in Item 6, the following are among the possible transducers:
  - 5.1. If using a neckloop as an output transducer, generate a magnetic field strength of at least 150 mA/meter. The peak field strength shall not exceed 600 mA/meter. Measurements shall be made at the geometric center of the plane of the neckloop.
  - 5.2. If using a silhouette as an output transducer, generate a magnetic field strength of at least 50 mA/meter. The peak field strength shall not exceed 200 mA/meter. Measurements shall be made at a distance of 10 centimeters from the silhouette.
  - 5.3. If using a miniature earphone as an output transducer, generate a sound pressure level of at least 80 decibels. The maximum high-frequency average sound pressure level shall not exceed 130 decibels.
  - 5.4. If a direct input cable is used between the output of the receiver and the input of a hearing aid boot or shoe, generate a minimum voltage range of 2 mV to 800 mV and match a boot/shoe input impedance of 50 ohms or greater. The plugs at either end shall be molded 2-pin, 3-pin and/or 3.5-millimeter mini-plug (stereo or mono).
6. The system must have inputs capable of accepting signals at line level and microphone level and must be capable of interfacing with existing public address systems or stand-alone.
7. The minimum sensitivity of the receiver shall be at least 2 mV at 12 decibel SINAD. The maximum RF

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100

signal generated by the transmitter shall not exceed 8,000 mV/meter at 30 meters.

8. Any stand-alone devices powered by 110–120 volt AC used as part of the system must be tested by an approved laboratory.
9. All input and output wiring must comply with the *New York City Electrical Code*
10. The installation of all stand-alone components of the system must comply with the *New York City Electrical Code*.
11. The frequencies used by the transmitter should be in compliance with applicable FCC rules.



# APPENDIX O RESERVED

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## APPENDIX P

# TYPE B+NYC UNIT TOILET AND BATHING ROOMS REQUIREMENTS

### SECTION BC P101 GENERAL

**P101.1 Scope.** All toilet and bathing rooms within a dwelling unit or sleeping unit subject to Appendix P pursuant to Section 1107.2.2 shall comply with Section P102. Within each such toilet and bathing room, at least one lavatory, one water closet and either a bathtub or shower shall comply with Section P102; additional fixtures provided within such toilet and bathing room shall comply with Sections 1004.11.3.1.1 (Lavatory), 1004.11.3.1.2 (Water Closet), and 104.11.3.1.3 (Bathing Fixtures) of ICC A117.1. Toilet and bathing fixtures shall be in a single room, such that travel between fixtures does not require travel beyond the room in which the fixture(s) of such toilet or bathing room is located. In a room, containing only a lavatory and a water closet, such lavatory and water closet shall comply with Section P102.

**Exception:** When a shower compartment is not the only bathing facility, such shower compartment shall have dimensions of 36 inches (914 mm) minimum in width and 36 inches (914 mm) minimum in depth.

### SECTION BC P102 TOILET AND BATHING ROOMS

**P102.1 Accessible route.** At least one accessible route shall connect all spaces and elements with each toilet and bathing room within a dwelling unit or sleeping unit unless as permitted in Section 1107.2.5, Condition 3. Accessible routes shall comply with ICC A117.1.

**P102.2 Operable parts.** Lighting controls, electrical switches and receptacle outlets, and environmental controls shall comply with Section 309 of ICC A117.1.

**P102.3 Doors.** Doors shall comply with Section 1107.2.1. Doors shall not swing into the clear floor or ground space or clearance for any fixture.

**Exception:** Doors may swing into the clear floor or ground space or clearances for fixtures where a clear floor or ground space complying with Section 305.3 of ICC A117.1 is provided within the room, beyond the arc of the door swing

**P102.4 Knee and toe clearance.** Clear floor space at fixtures shall be permitted to include knee and toe clearances complying with Section 306 of ICC A117.1.

**P102.5 Overlap.** Clear floor or ground spaces and clearances are permitted to overlap.

**P102.6 Lavatory.** Lavatories, including those within a toilet and bathing room accessed through a private office by a single occupant, shall comply with Section 606 of ICC A117.1.

**Exception:** Cabinetry shall be permitted under the lavatory, provided:

1. Such cabinetry can be removed without removal or replacement of the lavatory; and
2. The finish floor extends under such cabinetry; and
3. The walls behind and surrounding cabinetry are finished.

**P102.7 Mirrors and medicine cabinets.** Mirrors above lavatories shall have the bottom edge of the reflecting surface 40 inches (1016 mm) maximum above the floor or ground. Medicine cabinets, if provided, must include a storage shelf no higher than 44 inches (1118 mm) above the floor.

**P102.8 Water closet.** Water closets shall comply with Section P102. 8.

**P102.8.1 Location.** The water closet shall be positioned with a wall to the rear and to one side. The centerline of the water closet shall be 18 inches (457 mm) from the side wall.

**P102.8.2 Clearance.** Clearance around the water closet shall comply with Sections P102.8.2.1 through P102.8.2.3.

**P102.8.2.1 Parallel approach.** Where only a parallel approach is provided to the water closet, the clearance shall be 56 inches (1422 mm) minimum, measured perpendicular from the rear wall, and 48 inches (1219 mm) minimum, measured perpendicular from the sidewall. A lavatory complying with Section P102.6 shall be permitted on the rear wall, 18 inches (457 mm) minimum from the water closet centerline.

**P102.8.2.2 Forward approach.** Where only a forward approach is provided to the water closet, the clearance shall be 66 inches (1676 mm) minimum, measured perpendicular from the rear wall, and 48 inches (1219 mm) minimum, measured perpendicular from the side wall. A lavatory complying with Section P102.6 shall be permitted on the rear wall, 18 inches (457 mm) minimum from the water closet centerline.

**P102.8.2.3 Parallel and forward approach.** Where both a parallel and a forward approach are provided to the water closet, the clearance shall be 56 inches (1420 mm) minimum, measured perpendicular from the rear wall, and 60 inches (1524 mm) minimum, measured perpendicular from the side wall. No fixtures or obstructions, other than the water closet, shall be within the clearance.

**P102.8.3 Grab bars.** Grab bars for water closets shall comply with Section 609 of ICC A117.1 and shall be provided in accordance with Sections P102.8.3.1 through P102.8.3.2. Mounting heights of grab bars shall comply with Section 609.4 of ICC A117.1.

**Exception:** Grab bars are not required to be installed where reinforcement for such grab bars is installed and located to permit future installation of grab bars complying with Section P102.8.3.

**P102.8.3.1 Fixed side wall grab bars.** Fixed side wall grab bars shall be 42 inches (1067 mm) minimum in length, located 12 inches (305 mm) maximum from the rear wall and extending 54 inches (1372 mm) minimum from the rear wall. In addition, a vertical grab bar 18 inches (457 mm) minimum in length shall be mounted with the bottom of the bar located between 39 inches (991 mm) and 41 inches (1041 mm) above the floor, and with the center of the bar located at 30 inches (762 mm) from the rear wall.

**Exception:** Where a side wall is not available for a 42-inch (1067 mm) grab bar, the sidewall grab bar shall be permitted to be 24 inches (610 mm) minimum in length, located 12 inches (305 mm) maximum from the rear wall.

**P102.8.3.2 Rear wall grab bars.** The rear wall grab bar shall be 36 inches (915 mm) minimum in length, and extend from the centerline of the water closet 12 inches (305 mm) minimum on the side closet to the wall, and 24 inches (610 mm) minimum on the transfer side.

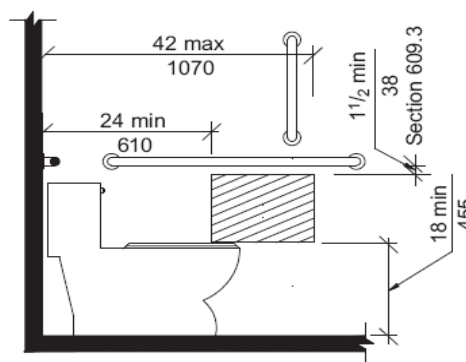
**Exception:** Where wall space will not permit a grab bar 36 inches (915 mm) minimum in length, rein-

forcement for a rear wall grab bar 24 inches (610 mm) minimum in length centered on the water closet shall be provided.

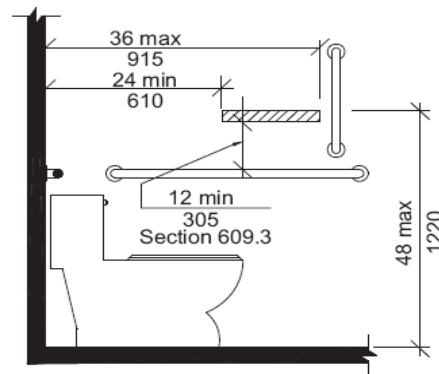
**P102.8.4 Height.** The top of the toilet seat shall be 15 inches (381 mm) minimum and 19 inches (483 mm) maximum above the floor or ground.

**P102.8.5 Flush controls.** Hand operated flush controls shall comply with Section 309 of ICC A117.1. Flush controls shall be located on the open side of the water closet.

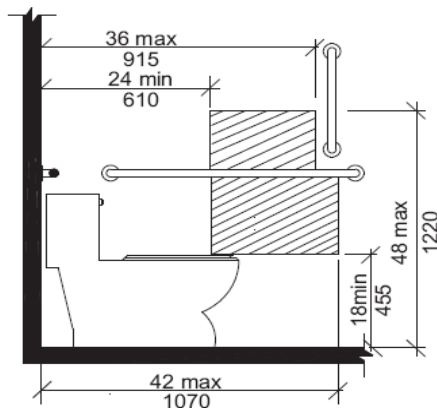
**P102.8.6 Dispensers.** Toilet paper dispensers shall comply with this section. Where the dispenser is located above the grab bar, the outlet of the dispenser shall be located within an area 24 inches (610 mm) minimum and 36 inches (915 mm) maximum from the rear wall. Where the dispenser is located below the grab bar, the outlet of the dispenser shall be located within an area 24 inches (610 mm) minimum and 42 inches (1065 mm) maximum from the rear wall. The outlet of the dispenser shall be located 18 inches (455 mm) minimum and 48 inches (1220 mm) maximum above the floor. Dispensers shall comply with Section 609.3 of ICC A117.1.



(a) Protruding Dispenser Below Grab Bar



(b) Protruding Dispenser Above Grab Bar



(c) Recessed Dispenser

FIGURE P102.8.6  
DISPENSER OUTLET LOCATION

**P102.9 Bathing facilities.** Where provided, a bathtub shall comply with Section P102.9.1, and a shower compartment shall comply with Section P102.9.2.

**P102.9.1 Bathtub.** Bathtubs, including those within a toilet and bathing room accessed through a private office by a single occupant, shall comply with Section 607 of ICC A117.1. Lavatories complying with Section P102.6 shall be permitted in the clearance required by Section 607.2 of ICC A117.1. Bathtub seats shall not be required.

**Exception:** Where a hand shower in compliance with Section 607.6 of ICC A117.1 is not provided, the owner shall provide such a hand shower at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.

**P102.9.1.1 Grab bars.** Grab bars for bathtubs, including those within a toilet and bathing room accessed through a private office by a single occupant, shall comply with Section 609 of ICC A117.1 and shall be provided in accordance with Section 607.4 of ICC A117.1.

**Exception:** Grab bars are not required to be installed where reinforcement for such grab bars is installed and located to permit future installation of grab bars complying with Section P102.9.1.1.

**P102.9.2 Shower.** Showers, including those within a toilet and bathing room accessed through a private office by a single occupant, shall comply with Section 608 of ICC A117.1.

**Exceptions:**

1. For showers other than transfer-type showers, counter tops and cabinetry shall be permitted at the control end of the clearance, provided such counter tops and cabinetry can be removed and the floor finish extends under such cabinetry.
2. Where a hand shower in compliance with Section 608.5 of ICC A117.1 is not provided pursuant to the exception in such section, the owner shall provide such a hand shower at the time a person with physical disabilities takes occupancy of the unit, or within 10 days of the date the request is made by a person with physical disabilities, whichever is later, at the owner's expense.

**P102.9.2.1 Grab bars and seats.** Grab bars and seats for showers, including those within a toilet and bathing room accessed through a private office by a single occupant, shall comply with Sections 609 and 610 of ICC A117.1 and shall be provided in accordance with Sections 608.2.3 and 608.3 of ICC A117.1.

**Exception:** Grab bars and seats are not required to be installed where reinforcement for such grab bars and seats is installed and located to permit future installation of grab bars and seats complying with Section P102.9.2.1.

## SECTION BC P103 REFERENCED STANDARDS

**P103.1 General.** This section lists the standards that are referenced in various sections of this appendix. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title and the section or sections of this document that reference the standard.

**P103.2 Subsequent additions, modifications or deletions.** Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to these standards in accordance with Section 28-103.19 of the *Administrative Code*.

**P103.3 Applicability.** The application of the referenced standards shall be as specified in Section 102.4.

**P103.4 Standards.**

ICC A117.1-2009	Accessible and Usable Buildings and Facilities	P102.1, et. al
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## APPENDIX Q

# MODIFIED NATIONAL STANDARDS FOR AUTOMATIC SPRINKLER, STANDPIPE, FIRE PUMP AND FIRE ALARM SYSTEMS

### SECTION BC Q101 SCOPE

**Q101.1 Scope.** This appendix provides the modifications to the nationally recognized standards NFPA 13, NFPA 13D, NFPA 13R, NFPA 14, NFPA 20, and NFPA 72, governing the installation and maintenance requirements of automatic sprinkler systems, standpipe and hose systems, fire pumps, and fire alarm systems. Where a referenced publication has been modified for the City of New York as by the *New York City Building Code* and the *New York City Fire Code*, every reference to such publication shall be deemed to include all such modifications.

### SECTION BC Q102 INSTALLATION OF SPRINKLER SYSTEMS

**Q102.1 General.** Sprinkler systems, where required by this code, shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2007 edition, modified for New York City as follows. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

**Chapter 1 Administration** No changes.

**Chapter 2 Referenced Publications**

**2.1** Add at end the following: "Where a referenced publication has been modified for the City of New York by the *New York City Building Code* and the *New York City Fire Code*, every reference to such publication shall be deemed to include all such modifications."

**2.3.7** Delete.

**Chapter 3 Definitions** No changes.

**Chapter 4 General Requirements** No changes.

**Chapter 5 Classification of Occupancies and Commodities** No changes.

**Chapter 6 System Components**

Add the following at the end of section 6.3.6.1: The use of pipe or tube other than that described above must involve consideration of many factors, including but not limited to the following:

1. Pressure rating.
2. Beam strength (hangers).
3. Corrosion (chemical and electrolytic).
4. Resistance to failure when exposed to elevated temperatures.
5. Methods of joining (strength, permanence, fire hazard).

6. Availability of fittings (for sprinkler outlets and proper routings).
7. Physical characteristics relating to integrity during earthquakes.
8. Toxicity.
9. Combustibility.
10. Movement during sprinkler operation (water distribution).

Add Section 6.3.6.5 Non-metallic piping and fittings are permitted to be used only in Group R Occupancies 6 stories or less in height.

**6.4.3** Delete the word "polybutelene."

**6.8.1.3** Delete.

**6.8.3** Delete.

Add Section 6.9.2.2.3 The alarm apparatus for a dry-pipe system shall also consist of approved low and high air pressure alarm attachments to the dry-pipe valve.

**6.9.5** Change "8.16.2.6" to "8.17.1.9".

### Chapter 7 - System Requirements

Add Section 7.2.6.2.4 High / Low air pressure in the system shall be monitored so that either condition sends a supervisory signal. Such signal shall trigger an audible alarm notification appliance, and shall report to a supervising station if the system is required otherwise to do so.

**7.6.3.1\*** Delete.

**Table 7.6.3.1** Delete.

**7.6.3.2** Add the following sentence at the end of section 7.6.3.2: Backflow Prevention Device relief discharge shall be piped to a safe location.

**7.7** Delete entire section including subsections.

**7.10** Delete entire section including subsections.

### Chapter 8 Installation Requirements

**8.2.1** Delete the first sentence and replace with the following: The maximum floor area on any one floor to be protected by a single riser from a control and alarm device shall be as follows:

**8.15.4.1\*** Delete the reference to section 8.15.4.4 and add at the end of this section the following: when required by other sections of this standard or the *New York City Building Code*.

**8.15.4.4** Delete.

**8.15.5.3\*** Delete the words "in elevator machine rooms or".

**8.15.8.1.2** Delete all words after and including "as defined".

**8.15.8.2\*** Delete and replace with the following: Closets and Pantries. Sprinklers are not required in clothes closets, linen closets, and pantries within:

- (1) Dwelling units in hotels and motels where the area of the closet or pantry does not exceed 24 square feet (2.2 m<sup>2</sup>), the least dimension does not exceed 3 feet (0.9 m), and the walls and ceilings are surfaced with noncombustible or limited-combustible materials; and
- (2) Dwelling units in Group R occupancies other than hotels and motels where the area of the closet or pantry does not exceed 12 square feet (1.1 m<sup>2</sup>), the room or space upon which the closet or pantry opens is equipped with sprinklers designed to afford protection to the opening of the closet or pantry, and the walls and ceilings of the closet or pantry are surfaced with noncombustible or limited-combustible materials.

**8.15.14** Delete entire section.

Add Section **8.15.19.4.5** In altering existing sprinkler systems which contain  $\frac{3}{4}$ -inch (19 mm) pipe, the existing  $\frac{3}{4}$ -inch (19 mm) pipe may be retained except that extension from such  $\frac{3}{4}$ -inch (19 mm) pipe shall be made using pipe having a minimum diameter of 1-inch (25 mm) except as provided for in Sections† 8.15.19.4.1, 8.15.19.4.2, 8.15.19.4.3 and 8.15.19.4.4.

Add Section† **8.15.19.4.6** Where nipples used are less than 1 inch (25 mm) diameter, nipples shall be schedule 80 and no longer than shoulder.

Add Section **8.16.1.1.1.4** An approved indicating shutoff valve may be used in lieu of an O.S.&Y. gate valve wherever referred to in these modifications except such valve shall not be part of the pressure reducing valve. The indicator shall be readily visible from the floor.

Add Section **8.16.1.1.1.5** A connection from public water system shall not extend into or through a building unless such connection is under the control of an outside indicator post or O.S.&Y. gate or under the control of an inside O.S.&Y. gate valve located near the outside wall of the building.

Add Section **8.16.1.1.1.6** All gate valves controlling water supplied for sprinklers shall be located where readily accessible and when necessary, permanent ladders, clamped treads on risers, chains and wheels, or other accepted means shall be provided.

Add Section **8.16.1.1.1.7** Floor control valves shall be provided where required or in special cases where area or height or number of tenants is excessive, both in manufacturing and mercantile buildings, or where contents are more than ordinarily susceptible to damage. Floor valves shall be located where they are readily accessible. They are to be O.S.&Y. or indicating type located ahead of the inlet of any pressure reducing valve.

Add Section **8.16.1.1.1.8** Valves controlling sprinkler supplied from the standpipe system shall be listed for standpipe service in the pressure zone in which it is installed. They shall be O.S.&Y. or indicating valves, and shall be located ahead of the inlet of any pressure reducing valve installed.

**8.16.1.1.2.2** Revise to read as follows: Floor control valves in high-rise buildings shall comply with section 8.16.1.1.2.1(1) or 8.16.1.1.2.1 (2).

**8.16.1.1.3.5** Delete and replace with the following: Where there is one water supply connection a check valve shall be installed. Such check valve may be a swing check, alarm check, an approved fire meter or an approved detector check.

**8.16.1.2.4** Delete all words including and after the word “unless”.

**8.16.1.2.5** Delete all words after and including the word “at”.

Add Section **8.16.1.1.3.6** Where a system having only one dry-pipe valve is supplied with city water and Fire Department connection, it will be satisfactory to install the main check valve in the water supply connection in a vertical position immediately inside of the building after the main indicating valve.

Add Section **8.16.1.1.3.7** Check valves on tank or pump connections, when located underground, may be placed inside of buildings and at a safe distance from the tank riser or pump, except in cases where the building is entirely of one fire area, in which case the check valve may be located over-head in the lowest level.

Add Section **8.16.1.1.4.4** Where either a wet or dry pipe sprinkler system is supplied by city water and a Fire Department connection and has more than one riser with O.S.&Y. gate valve in each, and the whole system is controlled by one outside post indicator valve, the main check valve in the water supply connection may be installed immediately inside building. If the supply is controlled by an underground gate valve with a Department of Environmental Protection standard curb, roadway or sidewalk flush box, the main check valve in the water supply connection should be installed immediately after the O.S.&Y. gate valve inside the building.

Add Section **8.16.1.1.4.5** A gate valve should be installed on each side of each check valve under conditions other than described in sections 8.16.1.1.4.1, 8.16.1.1.4.2, 8.16.1.1.4.3 and 8.16.1.1.4.4. However, this shall not apply to two-way Fire Department check valves.

Add Section **8.16.1.1.4.6** In a city connection serving as one source of supply the city valve in the connection may serve as one of the required gate valves. An O.S.&Y. valve or an indicator post valve should be installed on the systems (water supply) side of the check valve.

**8.16.1.1.5.1** Delete and replace with the following: Where a gravity tank is located on a tower in the yard, the gate valve on the tank side of the check valve shall be of O.S.&Y. type; the other shall be either an O.S.&Y. valve or other listed indicating valve. Where a gravity tank is located on a building, both gate valves shall be the O.S.&Y. type; and all fittings inside the buildings, except the drain tee fill line, and heater connections, shall be under the control of a gate valve.

Add Section **8.16.1.3.3** Where sprinklers are supplied from a yard main, a listed outside indicator post gate valve shall be placed in the connecting pipe at a safe distance from the building. Indicator post valves should be located not less than 40 feet (12 192 mm) from buildings; but where neces-

sary to place a valve close to a building, it should be located at a blank part of the wall.

Add Section **8.16.1.3.4** When a building has no basement, and an outside post indicator control cannot be furnished, a short post indicator may be installed in a horizontal position in riser with handwheel projecting outside of wall.

Add Section **8.16.1.4.2.7** Pits for underground valves except those located at the base of a tank riser, are described in the *Standard for Outside Protection* (ANSI/NFPA No. 24-2010). For pits protecting valves located at the base of a tank riser, refer to section 8.15.1.4.2.6.

**Table 8.16.2.4.2** Change the table to the following:

**TABLE 8.16.2.4.2  
SECTIONAL OR FLOOR VALVE SIZE  
MINIMUM SIZE OF DRAIN CONNECTION**

Up to 2 in.	1 in.
2½ in. to 4 in	1¼ in.
5 in. and larger	2 in.

Add Section **8.17.1.5.3** Identification signs shall be provided for outside alarm devices. The sign should be located near the device in a conspicuous position and shall be worded as follows: “SPRINKLER FIRE ALARM – WHEN BELL RINGS NOTIFY FIRE DEPARTMENT OR POLICE”.

**8.17.1.6** Add at end a new item 4 as follows: (4) Refer to NFPA 72 for further requirements.

Add Section **8.17.1.8** as follows:

#### **8.17.1.8 Dry Pipe System Alarms**

**8.17.1.8.1** The alarm apparatus for a dry-pipe system shall consist of approved low and high air pressure alarm attachments as well as waterflow pressure type alarm attachments to the dry-pipe valve. When a dry-pipe valve is located on the system side of an alarm valve, the actuating device of the alarms for the dry-pipe valve may be connected to the alarms on the wet-pipe system.

Add Section **8.17.1.9 Drains for Alarm Devices.**

**8.17.1.9.1** Where vents are necessary for satisfactory electric alarm switch operations, such vents should be properly piped to a drain.

**8.17.1.9.2** Drains from alarm devices shall be so arranged that there will be no danger of freezing, and so that there will be no overflowing at the alarm apparatus, at domestic connections or elsewhere with the sprinkler drains wide open and under pressure.

**8.17.1.9.3** Drain from retarding chamber and electric alarm switch shall be permitted to discharge through an open cone and be run separate from main system drains to a safe and visible point of free discharge or to sewer or ground drain. Drain from water-motor-operated alarm device may run separately to sewer or ground drain or may be connected to drain from retarding chamber at a point between such sewer and a check valve on this drain, a union or plug being inserted in the drain from the alarm device to permit inspection. Where checks are used they shall be so located as to

have the equivalent of at least a four-foot (1219 mm) head and shall not be installed in a vertical position.

**8.17.1.9.4** Where drains are conveyed to a sewer, a proper trap shall be provided.

**8.17.1.9.5** Where it is necessary to drain alarm valves outside the wall, an open discharge cone shall be provided inside to break the pipe line so that cold air will not conduct directly into the retarding chamber. Alternately, all drains shall have at least 4 feet (1219 mm) of pipe beyond the valves, in a warm area.

**8.17.2.2** Delete items 1 – 3 and add the following:

(1) Systems with sprinklered areas not exceeding 2000 square feet (186 m<sup>2</sup>).

(2) Systems containing 36 or fewer sprinkler heads except as otherwise required by other sections of this referenced standard.

**8.17.2.3** Delete items 1 – 3 and add the following:

(1) Minimum size of two-way Fire Department connection is 5 inch (127 mm) except for two-way Fire Department connections supplying a single system with a riser smaller than 5 inch (127 mm) where a 4 inch (102 mm) two-way Fire Department connection may be used.

Add Section **8.17.4.2.1** This test pipe shall be not less than 1-inch in diameter, located in the upper story, and the connection shall be permitted to be piped from the end of the most remote branch line. The discharge shall be at a point where it can be readily observed. In locations where it is not practical to terminate the test pipe outside the building, the test pipe may terminate in a drain. In such case, the test connection shall be made using a sight test connection containing a smooth bore corrosion resistant orifice giving a flow equivalent to one sprinkler. The test valve shall be located at an accessible point, and not over seven feet above the floor. The control valve on the test connection shall be located at a point not exposed to freezing.

**8.17.5.1.2** Add at the end “where a Standpipe System is not otherwise required by Section 905 of the *New York City Building Code*.”

**8.17.5.1.3** Delete items (1), (3), (4) and (5). Modify Item (2) by adding at the end “, separately valved and connected to each sprinkler riser for hose stations located in the area covered by the sprinkler system that such riser serves upstream of all sprinkler control valves or in lieu thereof connected to the riser of an adjacent system with areas of coverage as stated above and connected upstream of all sprinkler control valves” and renumber as item (1).

**8.17.5.1.4** Add at the beginning “Where a Standpipe System is not otherwise required by Section 905 of the *NYC Building Code*,” and delete item (2) and renumber items (3), (4) and (5) to (2), (3) and (4), respectively.

## **Chapter 9 Hangers**

**9.2.1.3.3** Delete all subsections and replace with the following:

**9.2.1.3.3.1** Listed flexible hose fittings and their anchoring components intended for use in installations connecting the



sprinkler system piping to sprinklers shall be rigidly fixed to the building structure at the sprinkler end of the flexible hose, independent of the ceiling suspension and support system in accordance with ASTM C 635, Section 3.1.1.10, as modified by Appendix R of the *New York City Building Code*.

## Chapter 10 Underground Piping

**10.10.1** Delete and replace with the following: The installing contractor shall perform all required inspections and acceptance tests in accordance with this chapter prior to scheduling an inspection.

**Figure 10.10.1** Delete.

## Chapter 11 Design Approaches

**11.1.4.2\*** Delete and replace with the following: The minimum water supply requirements for a pipe schedule designed sprinkler system shall be per the requirements of Section 11.2.2. The minimum water supply requirement for a hydraulically calculated sprinkler system shall be the calculated sprinkler system demand only, for the duration indicated in Table 11.2.3.1.2. Where gravity tanks are used as the supply or a portion of the supply to a hydraulically designed sprinkler system, it shall not be required to balance the calculated sprinkler flow and pressure demand to the outlet pressure of the gravity tank for the calculation of the water supply duration. The total water supply required shall be the product of the calculated system flow only, multiplied by the required water supply duration.

Add Section **11.1.4.2.1** In fully sprinklered buildings, where an Automatic Wet Standpipe System is not required by Section 905 of the *New York City Building Code*, the storage capacity of the fire reserve in the tank supplying water to the sprinkler system shall be as required for the sprinkler demand, at a minimum.

Add Section **11.2.2.10** Where the water supply to a system sized in accordance with the pipe sizing schedules is taken from a water storage tank, the adequacy of the tank capacity shall be verified with a hydraulic calculation.

Add Section **11.2.3.2.3.4** Reductions in the size of the calculated area of operation shall not be taken for the use of quick response sprinklers in the design of systems in existing buildings employing fixed duration stored water supplies of less than 5,000 gallons.

**Chapter 12 General Requirements for Storage** No changes.

**Chapter 13 Miscellaneous Storage** No changes.

**Chapter 14 Protection of Class I to Class IV Commodities That Are Stored Palletized, Solid Piled, Bin Boxes, or Shelf Storage** No changes.

**Chapter 15 Protection of Plastic and Rubber Commodities That Are Stored Palletized, Solid Piled, Bin Boxes, or Shelf Storage** No changes.

**Chapter 16 Protection of Class I Through Class IV Commodities That Are Stored on Racks** No changes.

**Chapter 17 Protection of Plastic and Rubber Commodities That Are Stored on Racks** No changes.

**Chapter 18 Protection of Rubber Tire Storage** No changes.

**Chapter 19 Protection of Roll Paper** No changes.

**Chapter 20 Special Designs of Storage Protection** No changes.

## Chapter 21 Special Occupancy Requirements

Add section **21.1.1.3** The application of the requirements of this Chapter are subject to the approval of the Fire Commissioner.

### 21.16.2.1.1 Gravity Waste and Linen Chutes

Add the following after the heading: Sprinklers shall be provided in chute vestibules on all floors; if no vestibule exists, sprinklers shall be provided above chute doors and shall be located no more than 1-foot (25 mm) horizontally from face of chute door. All building service chute sprinkler systems shall be provided with a local water flow and valve supervisory alarm with supervising station annunciation. In high rise buildings where sprinklers in chutes are supplied by a chute riser(s), such riser(s) shall be zoned to coincide with the zoning of the standpipe riser(s)".

## Chapter 22 Plans and Calculations

**22.1.3 (35)** Add the words "if required" at the end of this line item.

## Chapter 23 Water Supplies

**23.1.1** Add the following:

- (a) Two automatic sources of water supply shall be provided for sprinklers in:
  - (1) Buildings classified in occupancy group H.
  - (2) Buildings classified in occupancy group M when the area on one floor exceeds 20,000 square feet (1858 m<sup>2</sup>).
  - (3) Buildings classified in occupancy group A-1 with stages larger than 1,000 square feet (93 m<sup>2</sup>) in floor area or with a stage height greater than 40 feet (15 240 mm).
- (b) The domestic water supply may be used to supply any sprinklers required by the *New York City Building Code* Section 903 when installed in buildings classified in occupancy groups B, E, I and R, and not classified as a high-rise building, provided that all the requirements stated in subdivision (d) of this section are met.
- (c) The domestic water supply may be used to supply water to sprinklers in cooling towers if provision is made to automatically stop the use of water through the domestic supply lines and provided that all of the requirements stated in subdivision (d) of this section are met.
- (d) When the domestic water is used to supply sprinklers as permitted in subdivisions (b) and (c) of this section, all of the following conditions shall be met:
  - (1) The domestic water supply line from the tank or street supply shall be at least the size

of the sprinkler line and the capacity available shall be at least equal to the capacity required for the sprinklers.

- (2) The domestic water supply line from the tank or street shall have the required pressure as provided in this referenced standard.
- (3) The domestic water supply line shall be of nonferrous material except when the domestic water supply is four inches (102 mm) or more.
- (4) An O.S.&Y. valve or other listed valve having visual indication, and sealed open, shall be installed in the sprinkler supply branch, or such other valve arrangement as may be provided in this referenced standard and in referenced standards NFPA-13R or NFPA 13-D as modified for New York City, as applicable.
- (5) The pipe connecting the domestic water supply and the sprinkler control valve shall be of nonferrous material and not less than twelve inches (305 mm) long.
- (6) The number of heads in each fire section shall not exceed twenty, except that the number of heads in each fire section may exceed twenty in buildings classified in occupancy group R-2, or R-3 not exceeding six stories or 75 feet (22 860 mm) in height and in spaces classified in occupancy group R-2, or R-3 in buildings not exceeding six stories or 75 feet (22 860 mm) in height, provided that no more than 10 heads are supplied from any one domestic water riser.
- (7) The connection shall be made at the supply or riser side of any domestic branch control valves.
- (8) In connection with the above conditions, the number of fire sections having 20 or fewer heads may be unlimited; and the installation of alarms in branches supplying fire sections shall be at the option of the owner, except that such alarms shall be provided where required by referenced standards NFPA-13R and NFPA-13D as modified for New York City.
- (9) A check valve shall be installed on the sprinkler supply branch.

**23.1.3.2(1)** Delete the words “or Class II Standpipes”.

### **23.2.2 Pumps**

Add the following new sections:

**23.2.2.1 Combined Use.** In light hazard occupancies with only limited ordinary hazard areas, an automatic fire pump serving the lower 300 feet (91 440 mm) of the standpipe system may be used as the primary supply to the sprinkler system, provided that an automatic switching secondary power supply is available to drive the pump, where secondary power is required by other provisions of this code, and that

the pump is fully supervised as to pump running and power loss. The supervisory attachments shall be directly connected to an office where maintenance personnel are in attendance twenty-four hours a day; or, in lieu thereof, the supervisory attachment may be directly connected to the supervising station of an approved operating fire alarm company.

**23.2.2.2** In hydraulically designed sprinkler systems supplied from a gravity tank, the pressure may be increased by means of an automatic, special service fire pump. The pump shall be sized to satisfy the water supply requirements of this section and the *New York City Building Code* and shall be arranged with a bypass to permit the portion of the system so supplied to be served by the system's two-way Fire Department connections.

If the pump is not supplied from the street side of the building service switch, the electrical service and pump operation shall be fully supervised and an automatic switching secondary power supply provided to drive the pumps, where secondary power is required by other provisions of this code.

**23.2.2.3 Wiring for Fire Pumps.** When the fire pump feeder conductors are routed through the building(s), they shall be enclosed by 2 inch (51 mm) of concrete or an assembly which has a minimum of 2-hour fire resistive rating. Wiring for all fire and sprinkler pumps shall be in accordance with the *New York City Electrical Code*.

**23.2.2.4 Sprinkler Booster Pumps.** Where the pressure from the city water main is insufficient to comply with the requirements of this referenced standard, but is sufficient to provide at least 5 PSI (34 kPa) at the highest level of sprinklers as determined by test, an automatic, electrically driven pump installed for the purpose of boosting or increasing the city water pressure in the sprinkler system may be used subject to the following requirements:

- (a) Pumps shall be of approved centrifugal type, capable of delivering at least 200 gpm (757 L/m), and shall be capable of supplying the calculated flow and pressure demand of the sprinkler system.
- (b) Pumps shall be maintained under approved automatic control with closed circuit supervisory attachment. The supervisory attachments shall be directly connected to an office where maintenance personnel are in attendance twenty-four hours a day; or, in lieu thereof, the supervisory attachment may be directly connected to the supervising station of an approved operating fire alarm company. The supervisory alarm services shall be arranged so as to provide positive indication at an approved central office or sprinkler alarm panel board that the pump has operated or that the source of electrical supply has failed.
- (c) Such pumps shall also comply with the applicable provisions of this Referenced Standard and the *New York City Building Code* pertaining to Fire Pumps, except that only one water supply shall be required.
- (d) Power to such pumps shall be supplied from the street side of the building service switch. Secondary power shall be provided where required by other provisions of this code.

- (e) If a secondary power supply is provided to drive the pump and such power supply is automatic switching, the 5 psi (34 kPa) requirement in section 23.2.2.4 and the requirements of paragraph (d), for power to be supplied from the street side of the building service switch, may be waived.

### Pressure Tanks

**23.2.3.1 to 23.2.3.3.2** Delete and replace with the following:

**23.2.3.1** A pressure tank providing water supply in accordance with Table 11.2.2.1 or Section 11.2.3 is an acceptable water supply source. The total available quantity of water in pressure tanks need not exceed 15,000 gallons (56 781 L) when there is a secondary source of water supply available from a gravity tank or a street connection. The maximum gross capacity of a single pressure tank shall be 9,000 gallons (34 069 L) and shall include the needed extra capacity to fill dry-pipe or preaction systems when installed.

**23.2.3.1.1** Each tank shall be kept at a maximum of  $\frac{2}{3}$  full of water and a minimum of  $\frac{1}{3}$  full of air maintained under a minimum pressure of 75 psig (517 kPa). The water-to-air ratio shall be so proportioned and the tank so located that a minimum pressure of 15 psig (103 kPa) will be available on the highest line of sprinklers below the main roof when all the water has been discharged from the tank.

**23.2.3.1.2** The tank supports shall be designed on the basis of a full tank. The tanks shall be supplied with water through a fixed pipe, independent of the sprinkler piping and at least 2 inch (51 mm) in size. The water supply shall be capable of supplying the tank at a rate of at least 65 gpm (4 L/s) without decreasing the pressure in the tank. The tank shall have a fixed water level plate on the end of the tank opposite the gage glass, or equivalent devices, to indicate the level of the water in the tank.

**23.2.3.1.3** The air compressor shall be provided with automatic controls for maintaining the air pressure. The capacity of the compressor shall be sufficient to build up the tank pressure to 75 psig (517 kPa) within 3 hr. or less.

**23.2.3.1.4** Pressure tanks shall be provided with closed circuit high and low water and high and low air pressure alarms.

**23.2.3.1.5** Pressure tanks shall be located at or above the top level of sprinklers.

### Gravity Tanks

**23.2.4** Add at end the following: If any of the sprinkler heads are supplied from domestic water tanks, the combined water supply in the tank shall be at least 5,000 gallons (18 927 L). Further, the sprinkler water supply shall be taken from the lowest level of the tank.

Add Section **23.2.4.1** Combined Use. In A, B, E, I and R Occupancies, with only limited ordinary hazard areas, the sprinkler and standpipe reserve may be common to both. The Reserve shall be sized for the greater demand, in accordance with NFPA 14, section 7.10.1.3. For purposes of this section, limited shall be defined as less than 30 percent of the floor area on the given floor. Buildings whose occupancies are more than 85 percent light hazard may have a light hazard

water supply, provided the ordinary hazard areas are designed for ordinary hazard requirements with respect to sprinkler spacing and pipe sizing.

Add Section **23.2.4.2** Combined standpipe and sprinkler systems may be used in Occupancies A, B, E, F, I, M, and S. If an automatic fire pump is used as the primary supply, the requirements of section 23.2.2.1 shall apply.

### Chapter 24 Systems Acceptance

**24.1** Delete and replace with the following: The installing contractor shall inspect and test the installation in accordance with the procedures of this chapter prior to scheduling an inspection.

**24.2.1.1** Delete the words “2 hours” and replace with “1 hour”.

**24.2.1.5** Delete the words “2 hours” and replace with “1 hour”.

**24.2.1.10** Delete the words “150 psi (10.3 bar)” and replace with “200 psi (13.8 bar)”.

**24.3** Delete entire section.

**24.3.1** Delete.

**24.3.2** Delete.

**24.3.3** Delete.

**24.3.4** Delete.

**Chapter 25 Marine Systems** No changes.

### Chapter 26 System Inspection, Testing and Maintenance

**26.1** Delete and replace with the following: General. A sprinkler system installed in accordance with this standard shall be properly inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems* and the *New York City Fire Code*, to provide at least the same level of performance and protection as designed.

## ANNEXES

The annexes are not a part of the requirements of this Referenced Standard but are included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs. In the event of any conflict between the Annexes and the body of the Referenced Standard, particularly where modifications have been made for New York City, the body of the Referenced Standard will govern.

### Annex A

**A.5.2** Move Occupancy Classification of Theaters and Auditoriums from Light Hazard to Ordinary Hazard Group 1.

**A.11.1.5.2.3(3)** Delete.

**Annex B Miscellaneous Topics** No changes.

**Annex C Explanation of Test Data and Procedures for Rack Storage** No changes.

**Annex D Sprinkler System Information from the 1997 Edition of the *Life Safety Code*** No changes.

**Annex E Informational References** No changes.



## SECTION BC Q103 INSTALLATION OF SPRINKLER SYSTEMS IN ONE- AND TWO-FAMILY DWELLINGS AND MANUFACTURED HOMES

**Q103.1 General.** Sprinkler systems, where required by this code, shall be installed in accordance with NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2007 edition, modified for New York City as follows. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

**Chapter 1 Administration** No changes.

### Chapter 2 Referenced Publications

**2.2** Add at end the following: Where a referenced publication has been modified for the City of New York by the *New York City Building Code* and the *New York City Fire Code*, every reference to such publication shall be deemed to include all such modifications.

### Chapter 3 Definitions

**3.3.9.3** Delete.

**3.3.9.6** Delete.

### Chapter 4 General Requirements

**4.2.1** Add at end the following: The owner is responsible for the maintenance of the system.

**4.3.1** Delete and replace with the following: Where a Fire Department pumper connection is not provided, the system shall be hydrostatically tested for leakage at 50 psi (344 kPa) above normal system operating pressure and checked visually for leakage at each joint or coupling.

Add new Section **4.3.3** Fire Department connections are not required for systems covered by this standard, but may be installed at the discretion of the owner. In these cases, hydrostatic tests in accordance with Reference Standard NFPA 13-2007, as modified for New York City, are necessary. Dry systems should also be tested by placing the system under 40 pounds (2.8 bar) air pressure. Any leak that results in a drop in system pressure greater than 2 psi (0.14 bar) in 24 hours should be corrected. Check for leaks using soapy water brushed on each joint or coupling. Leaks will be shown by the presence of bubbles. This test should be made prior to concealing of piping.

### Chapter 5 System Components

**5.2.1** Add at end the following: Non-metallic pipe shall be used in wet systems only.

**5.2.1.3** Delete.

**5.2.2.2** Delete the words “and polybutylene (PB)”.

**Table 5.2.2.2** Delete the line for “*Standard Specification for Polybutylene (PB) Plastic Hot and Cold Water Distribution Systems*” and delete the reference to “ASTM D 3309”.

**5.2.9.2** Delete the words “and polybutylene (PB)”.

**5.3** Delete.

## Chapter 6 Water Supply

**6.2** Add the following as item (6):

(6) A common supply main to the building, serving both sprinklers and domestic uses, may be used if provision is made to prevent flow on the domestic water system upon operation of sprinklers, and closure of the main sprinkler control valve(the house control valve) will shut off the domestic water supply.

**6.3** Delete.

## Chapter 7 Installation

**7.1.1** Delete the remainder of the sentence starting with and including the word “unless”.

**7.1.2** Delete and replace with the following: Except for the meter set controlling combined domestic water and fire sprinkler systems, sectional control valves and other valves if provided in supply pipes to sprinklers shall be locked open and supervised open by one of the following methods:

- (a) Supervising station, proprietary or remote station signaling service, or
- (b) Local signaling service that will cause the sounding of an audible signal.

**Exception:** Underground gate valves with roadway boxes need not be supervised.

**7.1.3** Delete the remainder of the sentence starting with and including the word “other”.

**7.6** Add at the end the following: as modified for New York City.

## Chapter 8 System Design

**8.3.3.3.1.1** Delete and replace with the following: Arrangement of supply piping to an anti-freeze system shall be in accordance with NFPA-13-2007 as modified for New York City.

**8.3.3.3.1.2** Delete.

**8.3.3.3.1.3** Delete.

**8.3.3.3.1.4** Delete.

**8.3.3.3.2** Delete.

**8.3.3.3.2.1** Delete.

**8.3.3.3.2.2** Delete.

**8.3.3.3.2.3** Delete.

**8.4.3.2** Delete the remainder of the section starting with and including the word “unless”.

**8.4.3.3** Delete.

**8.6.4** Add the following after the word “garages”: provided that at least one sprinkler head is located within 3 feet (914 mm) of any communicating opening between the garage and the dwelling.

**8.6.5** Add after the word “attics”, the words “without floors”.



## ANNEXES

The annexes are not a part of the requirements of this Referenced Standard but are included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs. In the event of any conflict between the Annexes and the body of the Referenced Standard, particularly where modifications have been made for New York City, the body of the Referenced Standard will govern.

A.5.2.2.2 Delete.

A.5.2.9.2 Delete.

Figure A.6.2 (c) Delete the sprinkler control valve shown.

A.6.3 Delete.

Figure A.6.3 (a) Delete.

Figure A.6.3 (b) Delete.

Figure A.6.3 (c) Delete.

Figure A.6.3 (d) Delete.

A.8.4.3.3 (1) Delete.

Figure A.8.4.3.3(1) Delete.

Annex B Informational References No changes.

## SECTION BC Q104 INSTALLATION OF SPRINKLER SYSTEMS IN RESIDENTIAL OCCUPANCIES UP TO AND INCLUDING SIX STORIES IN HEIGHT

**Q104.1 General.** Sprinkler systems, where required by this code, shall be installed in accordance with NFPA 13R, *Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height*, 2007 edition, modified for New York City as follows. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

### Chapter 1 Administration

1.1 Delete the word “four” and replace with “six”.

### Chapter 2 Referenced Publications

2.2 Add at end the following: Where a referenced publication has been modified for the City of New York by the *New York City Building Code* and the *New York City Fire Code*, every reference to such publication shall be deemed to include all such modifications.

### Chapter 3 Definitions

3.3.6 Delete (Use definitions contained in *New York City Building Code*).

### Chapter 4 General Requirements No changes.

### Chapter 5 System Components

5.2.1 Add at the end the following: Non-metallic pipe shall be used in wet systems only.

5.2.2.2 Delete the words “and polybutylene (PB)”.

**Table 5.2.2.2** Delete “Specification for Polybutylene (PB) Pipe ASTM D 3309”.

5.2.10.2 Delete the words “and polybutylene (PB)”.

5.3.2(1) Delete and replace with the following: Antifreeze systems – Only glycerin type anti-freeze is permitted for use in systems containing non-metallic pipe or fittings.

## Chapter 6 Working Plans, Design, Installation, Acceptance Tests and Maintenance

6.3.2 Delete.

Figure 6.3.2 Delete.

6.3.3 Delete.

6.6.3 Add the following as item (5):

(5) A common supply main to the building, serving both sprinklers and domestic uses, may be used if provision is made to prevent flow on the domestic water system upon operation of sprinklers, and closure of the main sprinkler control valve (the house control valve) will shut off the domestic water supply.

6.6.5 Delete.

6.6.6 Delete.

6.7.1.2 Delete and replace with the following:

Except for the meter set controlling combined domestic water and fire sprinkler systems, sectional control valves and other valves if provided in supply pipes to sprinklers shall be locked open and supervised open by one of the following methods:

- (a) Supervising station, proprietary or remote station signaling service, or
- (b) Local signaling service that will cause the sounding of an audible signal at a constantly attended point.

**Exception:** Underground gate valves with roadway boxes need not be supervised.

6.7.4 Delete and replace with the following:

**Fire Department Connection.** Except in buildings classified in occupancy group R-1, at least one 3 in. (76 mm) single inlet Fire Department connection shall be provided and located in accordance with the *New York City Building Code*. Buildings classified in occupancy group R-1 shall be provided with two-way Fire Department connections in accordance with the referenced standard NFPA-13-2007 as modified for New York City. A Fire Department connection is not required in one- and two-family dwellings.

6.7.4.1 Delete.

6.7.4.2 Delete.

6.9.6\* After the word “attics” add the words: “without floors”.

Add Section 6.9.8 Location of sprinklers installed in buildings classified in occupancy group R-1 shall be in accordance with the requirements of the *New York City Building Code* and NFPA-13-2007 as modified for New York City.

6.10.2 Delete and replace with the following: Sprinkler systems shall be inspected, tested, and maintained in accordance

with the *New York City Fire Code* and with the rules of the Fire Department.

## ANNEXES

The annexes are not a part of the requirements of this Referenced Standard but are included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs. In the event of any conflict between the Annexes and the body of the Referenced Standard, particularly where modifications have been made for New York City, the body of the Referenced Standard will govern.

**A.1.1** Delete the words “four stories” and replace with the words: “six stories”.

**A.5.2.2.2** Delete.

**A.5.2.10.2** Delete.

**A.6.4.2** Delete the words “, or flexible piping such as listed polybutylene,” and delete the sentence that reads “Testing with air pressure is permitted for polybutylene piping where conducted in accordance with the testing procedures of section 24.2.2.1 of NFPA 13, *Standard for the Installation of Sprinkler Systems*.”

**A.6.6.5** Delete.

**Table A.6.6.5(a)** Delete.

**Table A.6.6.5(b)** Delete.

**Annex B Informational References** No changes.

## SECTION BC Q105 INSTALLATION OF STANDPIPE AND HOSE SYSTEMS

**Q105.1 General.** Standpipe and hose systems, where required by this code, shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2007 edition, modified for New York City as follows. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

**Chapter 1 General Information** No changes.

**Chapter 2 Referenced Publications**

**2.1** Add at end the following: Where a referenced publication has been modified for the City of New York by the *New York City Building Code* and the *New York City Fire Code*, every reference to such publication shall be deemed to include all such modifications.

**Chapter 3 Definitions**

**3.3.5** Add at end the following: For the purposes of this section, a penthouse of any area with an occupant load greater than 10 shall be considered a story.

**3.3.15.2** Add at end the following: Class II standpipe systems are permitted for high pile and rack storage occupancies only.

## Chapter 4 System Components and Hardware

**4.2.2** Delete and replace with the following: Pipe for buried portions of the standpipe system, whether inside or outside of the building, shall be red brass, ductile iron, hard tempered type “K” copper tubing, galvanized steel or other approved corrosion resistant material. All such pipe, other than ductile iron, shall be adequately wrapped or otherwise protected against corrosion.

Add Section **4.2.2.1** Where ductile iron pipe is installed in accordance with Table 4.2.1, it shall be lined in accordance with AWWA C 104, *Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water*.

**4.2.3** Add at end the following: Piping conforming to the specifications contained in this section may only be used in buildings with floor heights not exceeding 300 feet (91 440 mm) above grade plane or in the highest 300-foot (91 440 mm) portion of other buildings. Otherwise piping conforming to the wall thicknesses specified in section 4.2.4 shall be used.

**4.5.1** Add at end the following: 6 inch (152 mm) and larger sectional and riser control valves shall have a minimum  $\frac{3}{4}$  inch (197 mm) valved bypass.

**4.6.2.1** Change “30.5 m (100 ft)” to “38.1 m (125 ft)”.

**4.6.2.2** Delete.

**4.6.3.2** Delete.

**4.6.5** Delete and replace with the following: **Label.** Each rack or storage facility for 40-mm (1½-in.) hose shall be provided with a label that shall include operating instructions.

**4.7.2** Delete and replace with the following: Hose connections shall have nominal 2½ inch (64 mm) threads conforming to FDNY standards.

**4.8.2** Delete and replace with the following: Each Fire Department connection shall have at least two 3 inch (76 mm) internally threaded swivel fittings having threads conforming to FDNY standards and be of a minimum size of 5 inches (127 mm) except where supplying a single 4 inch (102 mm) standpipe riser, in which case the minimum size shall be 4 inches (102 mm).

**4.8.2.1** Add at end the following: Caps shall be painted red, except that the caps for combination standpipe and sprinkler systems shall be painted yellow, and caps for sprinkler systems only shall be painted green.

**4.8.2.2** Delete and replace with the following:

Two-way Fire Department connections shall be provided as follows:

- One two-way Fire Department connection shall be provided for each 300 feet (91 140 mm) of exterior building wall or fraction thereof facing upon each street or public space.
- Where buildings face upon two parallel streets or public spaces without an intersecting street or public space, one two-way Fire Department connection shall be provided for each 300 feet (91 140 mm) of exterior

building wall or fraction thereof facing upon each such parallel street or public space.

- (c) Where a building faces upon two intersecting streets or public spaces and the total length of the exterior building walls facing upon such streets or public spaces does not exceed 300 feet (91 140 mm) only one two-way Fire Department connection need be installed provided the two-way Fire Department connection is located within 15 feet (4572 mm) of the corner and on the street with the longest building frontage.
- (d) Where a building faces on three streets or public spaces, one two-way Fire Department connection shall be provided for each 300 feet (91 140 mm) of building wall or fraction thereof facing upon such streets or public spaces provided that at least one two-way Fire Department connection is installed on each of the parallel streets or public spaces, and further provided that the two-way Fire Department connections shall be located so that the distance between them does not exceed 300 feet (91 140 mm).
- (e) Where a building faces upon four streets or public spaces, at least one two-way Fire Department connection shall be provided on each street front or public space; however, only one two-way Fire Department connection need be provided at the corner of two intersecting streets or public spaces if the two-way Fire Department connection is located within 15 feet (4572 mm) of the corner and on the street with the longest building frontage or public space, and if the distances between two-way Fire Department connections, in all cases, do not exceed 300 feet (91 140 mm).
- (f) In any case where the exterior building walls of a building facing a street or public space are obstructed in part by another building, one two-way Fire Department connection shall be provided for each clear three hundred feet of exterior building wall or fraction thereof facing upon such street or public space.
- (g) Location.
  - (1) Two-way Fire Department connections shall be placed between 18 inches (457 mm) and 36 inches (914 mm) above the sidewalk level.
  - (2) Two-way Fire Department connections shall be of the flush or free standing type, and with the exception of the swivels, caps, and plugs, shall not project beyond the street property line. The riser pipe to a free standing two-way Fire Department connection shall be red brass. When two-way Fire Department connections are installed in wall recesses, the recesses shall be of ample size to permit convenient hose attachment.
- (h) Check valve. Each two-way Fire Department connection shall be provided with a swing-type check valve

inside of the building or in a valve pit outside of the building. In addition, each high zone two-way Fire Department zone shall be provided with a swing-type check valve located at each connection between the high zone two-way Fire Department express riser and the high zone standpipe system and located at the level of such connection.

- (i) Drip valve. A  $\frac{3}{4}$  inch (19mm) automatic ball drip valve shall be placed between the two-way Fire Department connection and the check valve, except that on a fireboat two-way Fire Department connection, a  $\frac{1}{2}$  inch (13 mm) open drip without a shutoff may be used. Automatic ball drips shall be placed in the horizontal position.
- (j) Two-way Fire Department connections shall be provided in maximum two-way Fire Department connection zone heights of 600 feet (15 240 mm), supplying no more than two standpipe zones. A normally closed valved interconnect shall be provided between each two-way Fire Department connection zone.
  - (1) Express piping to high zone two-way Fire Department connections shall not be installed in stairway enclosures but may be installed in any other protected shaft.
  - (2) Isolation valves shall be provided in all standpipe risers at 100 foot (30 480 mm) vertical intervals.

**4.10** Add at end the following: All interior signage shall have a red background with minimum 1 inch high white letters. All exterior signage shall have a white background with minimum 1 inch (25 mm) high red letters.

## Chapter 5 System Requirements

**5.1.3** Add at end the following: and Section 905 of the *New York City Building Code*.

**5.1.4** Delete.

**5.3.2.2** Delete.

**5.3.3.1** Delete.

**5.3.3.2** Delete all after the word "required" and add the following: except where specifically required by Section 905 of the *New York City Building Code*.

**5.4.1.1** Delete the words "any type described in Section 5.2" and replace with the words: manual-wet or automatic-wet.

**5.4.1.2** Delete the words "automatic or semi-automatic" and replace with the words: automatic-wet.

## Chapter 6 Installation requirements

**6.1.2.1** Add at end the following: in accordance with the requirements of section 905 of the *New York City Building Code*.

**6.1.2.2** Add at end the following: in accordance with the requirements of section 905 of the *New York City Building Code*.



### 6.1.2.3 Add at beginning the following: **Protection of standpipe system**

#### 6.1.2.3.1 Add at end the following:

All parts of the standpipe systems that may be exposed to frost shall be protected from freezing by any one of the following methods:

- (1) The piping shall be frostproofed with insulation having a thermal conductance of 0.1 Btu/hr. per square foot of surface per degree F at a mean temperature of 70 to 75 degrees F (21 °C to 24°C). Insulation shall be protected to prevent water infiltration, and when exposed to the weather the insulation shall be covered with a 45 pound (20 kg) roofing felt jacket or equivalent.
- (2) Steam or electric tracers may be used in conjunction with the insulation.
- (3) Tanks subject to freezing temperatures shall be protected.

**6.3.1.1** Add at end the following: Check valves other than those in two-way Fire Department and fire pump line shall be provided with an O.S.&Y. or indicating shutoff valve (with indicator readily visible from the floor) that is flanged, mechanically coupled or wafer type and connected to the inlet and outlet of such check valves. The valves on the suction and discharge of the fire pump shall be deemed to comply with this requirement when the discharge valve is placed on the discharge side of the check valve. One of the shutoff valves placed on each side of the tank check valve may be of the remote control type, and when used, shall be on the downstream side of such check valve.

#### 6.3.2 Add at end the following:

- (1) Riser control valves, shall where practical, be located within a required stair enclosure serving the entrance floor. Where the stair enclosure extends to the basement or cellar, the riser control valve may be located within the stair enclosure at or in the basement or cellar ceiling, providing that a sign indicating the valve location is installed within the stair enclosure at the entrance floor. The hose outlet valve for the entrance floor shall be located on the riser side of the riser control valve. Sectional control valves shall be provided at maximum 100 foot (30 480 mm) increments in all standpipe risers. Riser control valves or sectional valves shall not be required on a vertical line supplying one or two hose outlet valves.
- (2) Where riser control or section valves are located outside of a required stair enclosure, the valves shall be of such type and so installed so as to be remotely operated by either electric motors or hydraulic means. The remote control shall be from either the entrance floor or from a fire pump room. Operating devices shall be grouped, suitably housed, and kept locked with a Fire Department lock and key. The door of the housing shall be embossed to indicate the purpose of the device. Instructions for operating the remote valves by the control device shall be legible, detailed,

and complete, and shall be permanently secured to the inner face of the door.

- (3) Each valve shall be so designed and installed as to permit its manual operation at the valve location. Pressure ratings and the name of the manufacturer shall be cast raised or depressed on each valve used in the system.
- (4) The position of each remotely controlled valve, whether opened or closed, shall be indicated at its remote control point and also at the valve.
- (5) Valves shall be readily accessible for inspection, repair, and use. If the valve is placed so that its operating mechanism is more than 7 feet (2133 mm) above a floor or stair landing, a 12 inch (305 mm) wide wrought iron, steel or equivalent ladder securely fastened shall be provided for access to the valve. In lieu of a ladder, chain operated mechanisms are permissible and shall be padlocked securely in place.
- (6) Each control valve shall be conspicuously marked with the number assigned to it on the riser diagram for the standpipe system. Metal numbered tags at least 2 inch (51 mm) in diameter shall be securely attached to the valve. Each valve shall have a metal sign stating "STANDPIPE CONTROL VALVE" securely hung from the valve.
- (7) Each control valve not remotely controlled shall be electrically supervised in its normal position. If the normal position is the closed position, a metal placard stating such fact shall be conspicuously attached to the valve.

**6.3.4** Add at the end the following: Wafer type control valves may not be used in pump suction piping.

**6.3.7.1** Add at end of Item (3) the following: Only permissible when no fire alarm system is present and delete Item (4).

**6.3.8.3** Add at the end the following: Such sprinkler system piping supply shall only be permitted where approved by the commissioner.

**6.4.2** Add at end the following: In addition, each high zone two-way Fire Department zone shall be provided with a swing-type check valve located at each connection between the high zone two-way Fire Department express riser and the high zone standpipe system and located at the level of such connection.

**6.4.5.2** Delete and replace with the following: **Marking.** Each two-way Fire Department connection shall be provided with caps painted red, and shall have the word "STANDPIPE" in letters 1 inch (25 mm) high and 1/8 inch deep cast in the body or on a nonferrous metal plate secured to the connection or mounted on the wall in a visible location, except that caps of each two-way Fire Department connection used for combination standpipe and sprinkler systems shall be painted yellow and the words shall read "COMBINATION STANDPIPE AND SPRINKLER SYSTEMS". Where two-way Fire Department connections serve other than the entire building, the connections shall be marked in accordance with the specifications of this section "LOW ZONE" or "HIGH ZONE" and indicate the floors served.



**6.4.5.2.1 Delete.**

**6.4.6** Delete “1219 mm (48 in.)” and replace with the following: 914 mm (36 in.).

**Chapter 7 Design****7.1.1 Delete.**

**7.2** Delete and replace with the following: The maximum pressure at any point in the system at any time shall not exceed 24.1 bar (350 psi), except for piping to high zone two-way Fire Department connections, and shall not, in any case, be greater than the pressure rating of the system components in accordance with section 4.2 of this referenced standard. Maximum height per zone is limited to 300 feet (91 400 mm).

**7.2.1.1** Change the word “regulating” to “restricting”.

**7.2.1.2 Delete.**

**7.3.2** Delete all after the word “connections” and replace with the following: in accordance with the requirements of Section 905 of the *New York City Building Code*.

**7.3.2.1 Delete.**

**7.3.2.2** Delete and replace with the following: At the top of the highest riser there shall be provided, above the main roof level, a three way manifold equipped with three 2½ inch (63.5 mm) hose valves with hose valve caps. The lowest valve shall be located with the hose end at least 18 inch (457 mm) above the roof and the highest valve with the hose end not more than 60 inch (1524 mm) above the roof. The manifold may be set in a horizontal or vertical position, provided the hose outlets are set back between 18 inch (457 mm) and 60 inch (1524 mm) above the roof level. Where the manifold is located other than within a heated stair enclosure, the control valve shall be located in a horizontal run of piping below the roof, with a long stem extending through the roof and equipped with a wheel handle at its upper end at least 12 inch (304.8 mm) above the roof. Between the control valve and the manifold there shall be provided within the heated space a ½ inch (12.7 mm) open drip or a ¾ inch (19 mm) automatic ball drip, with the drip pipe extended to spill over a plumbing fixture or drain.

**7.3.2.3 Delete.**

**7.3.4.1** Delete all after the word “required”.

**7.3.4.1.1 Delete.**

**7.4** Add at end the following: and shall be provided in accordance with the requirements of Section 905 of the *New York City Building Code*.

**7.5** Delete all and replace with the following:

**Interconnection of Standpipes**

- (1) Standpipe systems that include more than one riser shall have all risers cross-connected at, or below, the street entrance floor level, except as otherwise provided in this section.
- (2) Standpipe systems in buildings required by the provisions of Section 905 of this code to have one or more zones shall be so designed and installed that the risers supplied from each zone will be cross-connected

below, or in, the story of the lowest hose outlets from the water source in each zone. Horizontal intermediate check valves shall be installed in the run of each riser continuing into a higher zone in such manner as to permit all upper zones of the system within each two-way Fire Department connection zone provided in accordance with section 4.8.2.2 to be fed through one riser from the zone below and to prevent any lower zone of the system from being supplied from a zone above, except as otherwise required by this referenced standard. Two-way Fire Department connection zones shall be interconnected as in accordance with Section 4.8.2.2(j).

- (3) Risers supplied by an upper level cross connection shall be provided with manual control valves or remote control valves, so arranged that risers supplied by the upper level cross connections may independently be shut off from the tank supplies.
- (4) Cross connections shall be at least as large as the largest riser supplied by the cross connection. However, when supplying two, but not more than four 4 inch (102 mm) risers, the cross connection shall not be less than 5 inches (123 mm). The cross connection shall not be less than 6 inches (152 mm) for all other riser combinations.
- (5) Where there is no cellar, cross connections may be hung from the ceiling of the lowest story.
- (6) Each two-way Fire Department connection shall be connected to a riser or to a cross connection connecting other two-way Fire Department hose connections or risers within each two-way Fire Department zone provided in accordance with section 4.8.2.2. The pipe from the two-way Fire Department connection to the riser or cross connection shall be five inch (123 mm) I.P.S., except that a 4 inch (102 mm) pipe shall be sufficient when such pipe supplies a single four inch (102 mm) riser system. The pipe from the two-way Fire Department connection shall be run as directly as practicable to the riser or cross connection.
- (7) When tanks are used for the primary water supply, the standpipe systems may use separate riser systems serving, respectively, low and high parts of the building. Separate gravity tanks or pressure tanks may supply each zone, but in every case the standpipe system shall be so designed that every hose outlet of the entire system can be supplied through the required cross connections from every two-way Fire Department connection within each two-way Fire Department connection zone provided in accordance with section 4.8.2.2.

**7.5.1** Delete.

**7.5.2** Delete.

**7.6.1** Delete and replace with the following: Class I and Class III standpipes in buildings with floor heights less than 150 feet (45 720 mm) above grade plane shall be at least 4 inches (100 mm) in size. Standpipes in buildings with floor

heights greater than 150 (45 720 mm) feet above grade plane shall be no less than 6 inches (150 mm) in diameter.

**7.6.3** Delete and replace with the following: In fully sprinklered buildings having a combined standpipe system that is hydraulically calculated, the minimum standpipe size in buildings with floor heights less than 150 feet (45 720 mm) above the lowest level of fire department vehicle access shall be 4 inches (102 mm).

**7.7.2** Delete the words, “or semiautomatic”.

**7.7.4** Delete.

**7.8.1** Delete “100 psi (6.9 bar) and replace with “65 psi (4.5 bar).

**7.8.2** Delete.

**7.8.2.1** Delete.

**Table 7.8.2.1** Delete.

**7.8.2.2** Delete.

**7.8.3.1** Change the word “regulating” to “restricting”.

**7.8.3.2** Change the word “regulating” to “restricting”.

**7.8.3.3** Change the word “regulating” to “restricting”.

**7.9.1** Add after the word “pumps” the words “or tanks”. Add after the word “pump” the words “or tank”.

**7.9.1.1** Delete and replace with the following: The maximum standpipe system zone height for any building is 91 440 mm (300 feet). In the lowest zone in a building, such height shall be measured from grade plane. Floors below grade plane may be included in the lowest zone, provided that the maximum two-way Fire Department connection zone height for the two-way Fire Department connection zone that includes the lowest zone, in accordance with Section 4.8.2.2(j), is not exceeded.

**7.9.3** Delete.

**7.9.3.1** Delete.

**7.9.3.2** Delete.

**7.9.4.1** Delete and replace with the following: In buildings with occupied floors less than 91.4 m (300 feet) in height above the lowest level of Fire Department vehicle access, water supplies may be provided by a public waterworks system in accordance with 9.1.5(1), by automatic fire pumps in accordance with 9.1.5(2), or by gravity tanks in accordance with section 9.1.5(4).

Add Section **7.9.4.2** All zones servicing occupied floors located higher than 91.4 m (300 feet) above the lowest level of fire department vehicle access shall be equipped with a primary and auxiliary water supply provided by gravity tanks supplemented by pumps where necessary in accordance with section 9.1.5.

Add Section **7.9.4.2.1** All zones servicing occupied floors located higher than 91.4 m (300 feet) above the lowest level of fire department vehicle access but not more than 152.4 m (500 feet) above grade plane, shall be equipped with a special service fire pump, in accordance with section 9.1.5(4)(1), to boost supply to pressures as required by section 7.8.1 and 7.8.3.1. A Pressure Reducing Valve (PRV) bypass shall be

provided, where necessary, and arranged to provide water supply from the upper zone to the lower zone at the required pressures. Where a PRV is not necessary to provide required pressures, a normally open bypass shall be provided.

Add Section **7.9.4.3** Where portions of a standpipe system service floors located 152.4 m (500 feet) or more above the lowest level of fire department vehicle access, all portions of the system shall be provided with a primary and auxiliary means of water supply in accordance with section 9.1.5 and the following:

- (1) Primary water supplies shall serve one zone only as the primary supply. However, the primary water supply for one zone may be used as the auxiliary supply for no more than one other zone.
- (2) Intermediate tanks, which serve as the suction source for the pumps providing primary water supply for zones located higher than 91.4 m (300 feet) above grade plane, shall be located so as to provide the auxiliary water supply for the next lowest zone at the required pressures by gravity only, and such pressures shall not exceed the minimum pressures required in such next lowest zone by more than 15 percent.
- (3) The auxiliary water supply for the topmost section of the system zone shall be provided by a gravity tank in accordance with section 9.1.5(4) and shall be equipped with a special service fire pump, in accordance with 9.1.5(4)(1), to boost supply to pressures as required by sections 7.8.1 and 7.8.3.1.
- (4) Zone heights shall be selected such that the topmost zone has a minimum height of 45.7 m (150 feet) so as to provide an auxiliary water supply from the intermediate or roof tank(s) to the next lowest zone at pressures as required by section 7.8.1 and 7.8.3.1 by gravity only, and such pressures shall not exceed the minimum pressures required in such next lowest zone by more than 15 percent.

**7.11.1** Delete the words “76 mm (3-in.)”. Add after the word “riser” the following: of adequate size. Add after the word “standpipe” the following: or attached sprinkler system.

**7.11.1.1** Delete and replace with the following: The riser shall be equipped with a plug and be located on every floor.

**7.11.1.4** Delete.

**7.12.1.1** Delete.

**7.12.2** Add at end the following: and be located in accordance with Section 4.8.2.2 of this referenced standard.

**7.12.2.1** Delete.

**7.12.3** Delete.

**Chapter 8 Plans and Calculations** No changes.

**Chapter 9 Water Supplies**

**9.1.1** Delete the words “and semi-automatic”.

**9.1.2** Add at the end the following: Where manual combination standpipe systems are provided in accordance with the provisions of section 5.4.1.1 of this referenced standard an automatic water supply sufficient to provide the required sprinkler system demand shall be provided. Where such sup-

ply is provided by an automatic fire pump, the minimum pump capacity shall be as required by the sprinkler system demand in accordance with Section 903 of the *New York City Building Code* and NFPA 13. Where such water supply is provided by pressure or gravity tanks the minimum water supply shall also be as required in accordance with the above.

**9.1.3** Delete the words “or semi-automatic”.

**9.1.4** Delete the words “a secondary” and replace with “an auxiliary”.

**9.1.5** Delete and replace with the following:

Water supplies from the following sources shall be permitted:

- (1) A public waterworks system where pressure and flow rate are adequate as confirmed by a statement by the Bureau of Water Supply of the Department of Environmental Protection.
  - (a) Each service directly supplying a standpipe system or a fire pump shall be equipped with a control valve located under the sidewalk in a flush sidewalk box located within two feet (610 mm) of the street line, or in such other locations as may be approved by the Department of Environmental Protection. The purpose of each such control valve shall be clearly indicated by the words. “Standpipe Supply Control,” cast in the cover of such flush sidewalk, box or, in lieu thereof, a metal sign with 1 inch lettering shall be located on the exterior building wall indicating the use and location of the valve.
- (2) Automatic fire pumps connected to an approved water source in accordance with NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection* and the following:
  - (a) Any required automatic fire pump shall draw from two independent street water mains in different streets, except that: (1) any automatic fire pump serving a building classified in occupancy group R-2 that is fully protected by a system of automatic sprinklers may draw from a single water main; and (2) an automatic fire pump may draw from a single water main if augmented by a suction tank or tanks, and if the valves at the meter and pump are provided with tamper switches that are wired to an approved supervising station of an operating fire alarm company. Where two services are installed, one service from the street water main shall be run directly to the pump, and the other service may be used for domestic water supply. The connection from water to the mains to the pumps shall be at least six inch (152 mm) pipe size and shall be flushed before connection is made to the system. Connections shall be in accordance with the provisions of the *New York City Plumbing Code* and applicable referenced standards.
  - (b) In the event that two separate and distinct water mains are not available as a supply or the street

mains cannot produce the required supply, there shall be provided a suction tank, or tanks suitably located and of sufficient capacity to furnish the fire pump with at least a one-half hour supply at the rated capacity of such pump. Suction tanks shall be filled by a six inch (152 mm) connection to the water main, controlled by an automatic ball float valve in the suction tank. A six inch (152 mm) bypass shall be provided so that pumps may be fed directly from the street water main.

- (c) When a water service supplies both the domestic service and the fire pump, a remote control valve shall be placed on the domestic service connection at the point where such connection is taken from the city supply or service main. Such remote control valve shall be controlled from a point near the pump control panel. In lieu of a remote control valve, a manually operated valve may be installed to shut off the entire domestic water supply to the building, provided such valve is located in the fire pump room and is properly tagged for identification.
- (d) Power supply for standpipe fire pumps. The type of fire pump and prime mover used in a standpipe system shall be suitable for the required service in a standpipe system provided for Fire Department use. If the prime mover employs any form of power other than an electric current supplied by a public utility, the use thereof shall be subject to the approval of the commissioner. Electrical power to the motor shall be taken from the street side of the house service switch. Where an emergency secondary power source is required, fire pumps shall be supplied from such source and power supply shall be automatic switching.
- (e) When the fire pump feeder conductors are routed through the building(s), they shall be enclosed by 2 inches (51 mm) of concrete or an approved assembly which has a minimum of 2-hour fire resistive rating.
- (f) Fire pumps shall be placed on concrete pads at least 12 inches (305 mm) above the pump room floor with a clearance of at least 3 feet (914 mm) maintained on all sides from walls or from other equipment in the pump room. In the event of the use of a vertical shaft centrifugal fire pump, the 12 inch (305 mm) high concrete pad may be omitted, provided the bottom of the electric driving motor and all electrical appurtenances are raised at least 12 inches (305 mm) above the pump room floor. Fire pumps shall be located in a 2-hour fire-rated enclosure.
- (g) Each automatic fire pump shall be equipped with a 3 inch (76 mm) National Pipe Thread pressure relief valve installed in the pump discharge. Such relief valve shall be set to relieve



below the shutoff head of the pump, but above the pressure required to maintain the operating pressure at the highest hose valve. The discharge from the relief valve may be piped back into the suction side of the pump on the pump side of the suction valve provided a visual sight glass is installed in the discharge of the relief valve. Automatic fire pumps may be provided with a time delay switch to ensure a minimum running time for the pump.

- (h) The check valves in the pump discharge line shall be either swing type or spring loaded.
  - (i) Where a group of two or more buildings, whether connected or separated, are operated under a single ownership, one fire pump may be accepted as the water supply for the group. The pump shall be installed in the building where the maintenance personnel are located, and a metal sign with 1 inch (25 mm) lettering shall be installed in each building at all of the hose outlets on the entrance floor indicating the location of the fire pump.
- (3) Pressure tanks installed in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection* and the following:
- (a) The water storage quantities required for the tanks are met with an additional volume equivalent to one-half of the required water storage space provided for the required air.
  - (b) An air compressor is provided with suitable automatic control and of sufficient capacity to build up air pressure of at least 75 psig (517 kPa) in the tank within three hours and to maintain thereafter an air pressure between 70 and 80 psig (482 to 552 kPa). The automatic control shall also maintain the proper air-to-water ratio in the pressure tank.
  - (c) Pressure tanks shall be supplied with water through a fixed pipe, independent of the standpipe riser and at least two inches (51 mm) in size. The water supply and connection shall be capable of supplying the tank at a rate of at least 75 gpm (5 L/s) without reducing the pressure in the tank. The tank shall have a fixed water level plate on the end opposite the gauge glass, or other equivalent indicating device.
  - (d) All pressure tanks used to provide the required primary water supply of a standpipe system shall be equipped with a high and low air pressure and a high and low water level electrical alarm system. Air-to-water ratio shall be 1 to 2 by volume and may be maintained by automatic electrical controls.
- (4) Gravity tanks installed in accordance with NFPA 22, *Standard for Water Tanks for Private Fire Protection* and the following:

- (a) Construction and support of tanks. Tanks for the standpipe system supply shall be constructed and supported in accordance with the provisions of Referenced Standard NFPA 22 and applicable provisions of the *New York City Building Code* for loads and structural work. Tanks with a total capacity of 15,000 gallons (56 775 L) or greater shall be multi-compartment type such that no compartment is larger than one half of the required standpipe water supply reserve plus the domestic water reserve in combination tanks. In the alternative, multiple tanks may be provided, provided that the above criteria are met.
- (b) Combination tanks. Gravity tanks may be used to provide the required primary water supply to the standpipe system and may also be used to supply automatic sprinkler and/or domestic water in a building provided all the following conditions are met:
  - (1) The connections to the tank are made in such a manner as to provide the required sprinkler and/or fire standpipe reserve. The domestic supply is above the sprinkler and/or standpipe reserve. Where a standpipe riser is used to supply water to a combination sprinkler and standpipe system as permitted, the connection to the tank shall be made in such a manner as to provide the required sprinkler or standpipe reserve, whichever is greater.
  - (2) The connections to the system are made outside of the tank. When connections or piping are installed inside the tank, the piping shall be assembled without couplings and shall be of red brass or approved equivalent material in accordance with the *New York City Plumbing Code* and applicable referenced standards.
  - (3) The tank is filled by means of an automatic pump at a rate of not less than 65 gpm (4 L/s).
- (c) Filling of tanks.
  - (1) Pressure or gravity tanks shall be filled at the rate of at least 65 gpm (4 L/s). Pipes used to fill the tanks shall not be used for any other purpose; nor shall required fire pumps be used for filling purposes.
  - (2) Where there is sufficient pressure in the city water main to fill tanks at the required rate during all hours of each day, and a filling pump is not provided, the connection to the city water supply shall be made near the point where the city water service enters the building.



- (3) A combined fire standpipe reserve and domestic water tank shall only be filled by direct public water connection or separate fill pumps, or direct connection to equipment, or pumps used to supply domestic water systems in accordance with the *New York City Plumbing Code* and applicable referenced standards.
- (d) Emergency drains on standpipe tanks. Each standpipe tank shall be provided with a drain of at least 4 inches (102 mm). National Pipe Thread. Each drain pipe shall be controlled by a manually operated gate valve located so as to be readily accessible. The drain shall be installed in accordance with the *New York City Plumbing Code* and applicable referenced standards.
- (e) Heating of standpipe tanks.
- (1) Where the water in the tank is subject to freezing, the tank shall be equipped with a tank heater in accordance with the provisions of NFPA 22.
  - (2) Where the standpipe supply and domestic water supply are combined in a single tank, heating of such tank shall not be required in hotels, multiple dwellings, hospitals, or other occupancies where the domestic supply is drawn upon during all hours of every day of the week.
- (f) Strainer.
- (1) Every standpipe gravity or suction tank shall be provided with a brass or bronze strainer at the discharge to risers or to pump supply lines.
  - (2) Each strainer shall have clear openings with an aggregate area equal to, or more than, the required area of the pipe into which the tank discharges. Openings shall be not more than 1 inch (25 mm) nor less than  $\frac{1}{2}$  inch (13 mm) in diameter.
- (g) Overflow pipe for standpipe tanks. Each gravity standpipe tank shall be provided with an overflow in accordance with the *New York City Plumbing Code* and applicable referenced standards.
- (h) Access to standpipe tanks. Access to the top of each gravity tank shall be by means of a steel, wrought iron or approved equivalent material gooseneck ladder, constructed of flat side bars at least 2 inches by  $\frac{3}{8}$  inch (51 mm by 10 mm), or equivalent, spaced at least 14 inches (7620 mm) apart, with round or square rungs at least  $\frac{5}{8}$  inch (16 mm) thick spaced not more than 12 inches (305 mm) on centers. The ladder shall be rigidly braced and shall not tip outward from the vertical at any point. When ladders exceed 25 feet (610 mm) in height, body irons spaced not more

than 2 feet (610 mm) on center and a metal platform at least 14 inches (355 mm) square, rigidly secured to the stringers of the ladder or other type of enclosed safe access, shall be provided near the top of the tank.

- (i) Gravity tanks shall be equipped with a high and low water level electrical alarm system.
- (j) Where a group of two or more buildings, connected or separated, is operated under a single control, a single gravity tank may be accepted as the primary water supply for the several standpipe systems of such group, provided a dead riser is carried from the bottom of the tank to an underground header or cross connection system and provided each building unit has a post indicator type control valve outside or an O.S.&Y. control valve inside the building at a readily accessible location. The underground cross connection may not cross any public street without the approval of the city departments having jurisdiction.
- (k) The bottom of the topmost zone gravity tanks shall be located above the highest hose outlet in the zone that such tank supplies, excepting the roof manifold and those hose outlets in a penthouse enclosing mechanical equipment. Pressures may be boosted by use of automatic special service or other fire pump(s) to provide the hose outlet pressures required by section 7.8.1 of this referenced standard. Tanks in intermediate zones may be sufficiently elevated to provide the pressures required by Section 7.8.1 provided that they are also installed in accordance with Sections 7.9.4.2 and 7.9.4.3.
- (l) The special service pump, as required by this standard, may be located anywhere in the zone served, provided that an express piped suction supply is installed from the gravity tank(s) that supply such pump, and such pump is located at a lower elevation than the gravity tank. Special service pumps are to be installed in accordance with the requirements of Sections 9.1.5(2) - (d), (e), (f) and (h).

**9.2** Add at end the following: except where manual standpipe systems are permitted in accordance with Section 5.4.1.2, water supplies shall be provided in accordance with Section 9.1.3 of this referenced standard.

**Add Section 9.4 Minimum Supply for Group R-2 Occupancies.** The water supply servicing standpipe systems in Group R-2 occupancies shall be 500 gpm (32 L/s) per zone with a stored water supply in any gravity tank or intermediate tank of 15,000 gallons. Water supplies shall be permitted to comply with requirements of Section 7.9.4 for primary and auxiliary water supplies.

**Chapter 10 Water Supply Testing** No changes.

**Chapter 11 System Acceptance**

**11.4.1\*** Delete the words “200 psi (13.8 bar)” and replace with “300 psi (20.7 bar)”. Delete the words “2 hours” and replace with “1 hour”. Delete the words “150 psi (10.3 bar)” and replace with “250 psi (17.3)”.

**11.5.4** Delete.

**11.5.4.1** Delete.

**11.5.4.2** Delete.

**Chapter 12 Buildings Under Construction**

**12.1** Delete the words “Where required by the authority having jurisdiction”. Add at the end of the last sentence: “or demolition. Provision shall be made for the use of such standpipe by the Fire Department when the height of building construction or demolition exceeds 75 feet.”

**12.2** Delete and replace with the following: The standpipe shall be provided with a readily accessible two-way Fire Department connection at street level. The location of the two-way Fire Department hose connection shall be placarded, kept free from obstruction, and identified by a red light.

**12.3** Add the following:

Temporary risers shall be at least 4 inches in (102 mm) diameter for structures less than 450 feet high (137 160 mm) and at least 6 inches (152 mm) in diameter for structures 450 feet (137 160 mm) high or more. There shall be as many risers as will be, or were, required for the permanent system. Each such riser shall be connected to a cross connection that is supplied through two-way Fire Department hose connections at the street level, and shall be equipped on each floor with a 2½ inch (64 mm) hose outlet valve. The installations shall be made so that each riser, cross connection, and branch line can be plugged or capped when work is not being done on the system.

**12.8.2** Delete the words “is permitted by the authority having jurisdiction”.

**ANNEXES**

The annexes are not a part of the requirements of this Referenced Standard but are included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs. In the event of any conflict between the Annexes and the body of the Referenced Standard, particularly where modifications have been made for New York City, the body of the Referenced Standard will govern.

**Annex A - Explanatory Material**

Delete Figures A.7.1(b) and A7.1(c).

**A.7.3.2** Delete.

**A.7.3.2.3** Delete.

Delete Figures A.7.3.2(a), (b) and (c).

**Annex B Informational References** No changes.

**SECTION BC Q106  
INSTALLATION OF STATIONARY FIRE PUMPS**

**Q106.1 General.** Fire pumps, systems, where required by this code, shall be installed in accordance with NFPA 20, *Standard for the Installation of Stationary Fire Pumps for Fire Protection*, 2007 edition, modified for New York City as follows. Refer to the rules of the department for any subsequent additions, modifications or deletions that may have been made to this standard in accordance with Section 28-103.19 of the *Administrative Code*.

**Chapter 1 Administration** No changes.

**Chapter 2 Referenced Publications** No changes.

**Chapter 3 Definitions**

**3.3.37.5** Add the following sentence at the end: This definition is for use with this referenced standard only.

**Chapter 4 Reserved**

**Chapter 5 General Requirements**

**5.12.1.1.1\*** Delete “by 2-hour fire-rated construction” and replace with the following: as required by the *New York City Building Code*.

**5.12.1.1.2** Delete “by fire-rated construction in accordance with Table 5.12.1.1.2” and replace with the following: as required by the *New York City Building Code*.

**Table 5.12.1.1.2** Delete.

**5.16.1** Delete “by one of the following methods” and replace with the following: in accordance with the requirements of Sections 903, 905 and 907 of the *New York City Building Code*. Delete items (1) through (4).

**5.18.1.2\*** Add the following language after “by this standard”: and as required by Q105.1 – 9.1.5 (2)(g).

**5.28.2** Add the following sentence at the end: and the requirements of the *New York City Electrical Code*.

**Chapter 6 Centrifugal Pumps** No changes.

**Chapter 7 Vertical Shaft Turbine/205 Type Pumps** No changes.

**Chapter 8 Positive Displacement Pumps** No changes.

**Chapter 9 Electric Drive for Pumps**

**9.1.3** Add the following sentence at the end: and the requirements of the *New York City Electrical Code*.

**9.2.2\* (5)** Add the following sentence at the end: and the requirements of the *New York City Electrical Code*.

**9.3.1** Delete and replace with the following: where required by the New York City building code, an alternate power source shall be provided and installed in accordance with *New York City Electrical Code*.

**ANNEXES**

The annexes are not a part of the requirements of this Referenced Standard but are included for informational purposes only. These annexes contain explanatory material, numbered to correspond with the applicable text paragraphs. In the event of any conflict between the Annexes and the body of the Referenced Standard, particularly where modifications have been made for New York City, the body of the Referenced Standard will govern.

**Annex A Explanatory Material** No changes.

**Annex B Possible Causes of Pump Troubles** No changes.

**Annex C Informational References** No changes.

**Annex D Material Extracted by NFPA 70, Article 695**  
Delete.





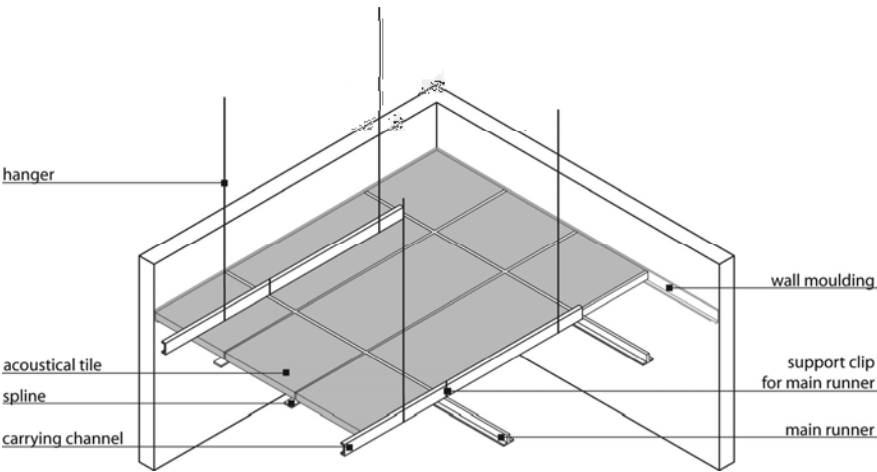


FIGURE 1A  
INDIRECT HUNG SUSPENSION SYSTEM

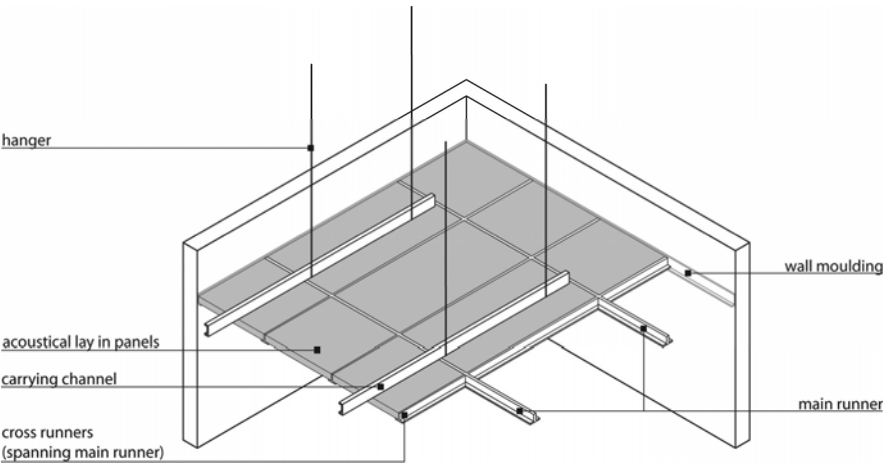


FIGURE 1B  
INDIRECT HUNG SUSPENSION SYSTEM

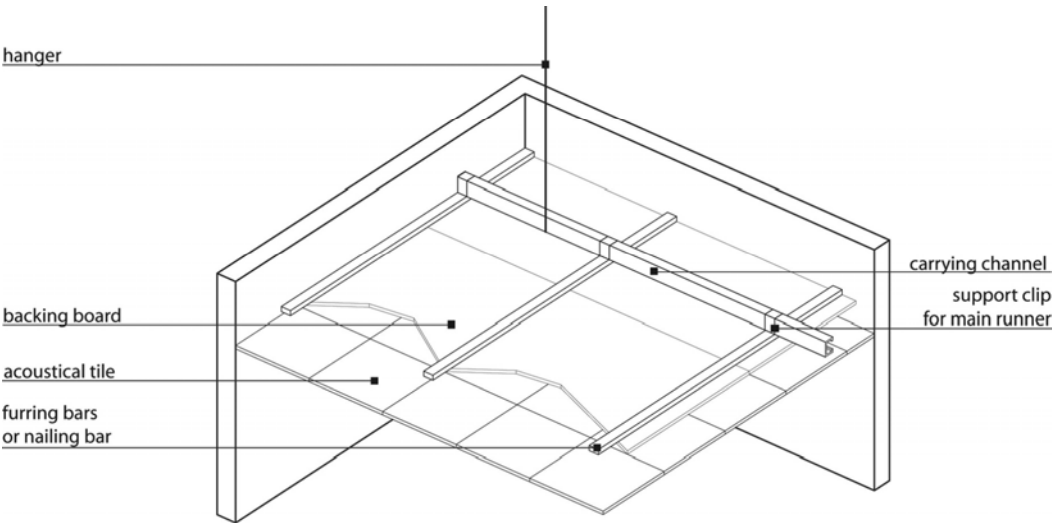
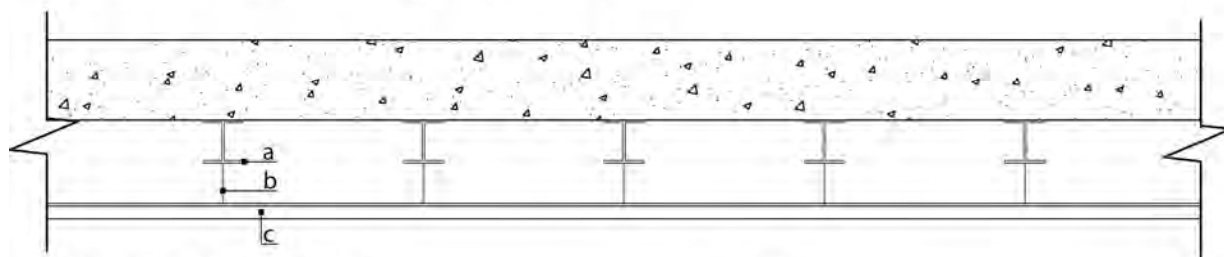


FIGURE 1C  
FURRING BAR SUSPENSION SYSTEM



- 
- The diagram shows a cross-section of a reinforced concrete beam. The width of the beam is labeled  $b$ . The effective depth, measured from the top of the beam to the center of the reinforcement, is labeled  $a$ . The distance from the bottom of the beam to the center of the reinforcement is labeled  $c$ . The reinforcement is represented by a row of triangles within the beam's cross-section.

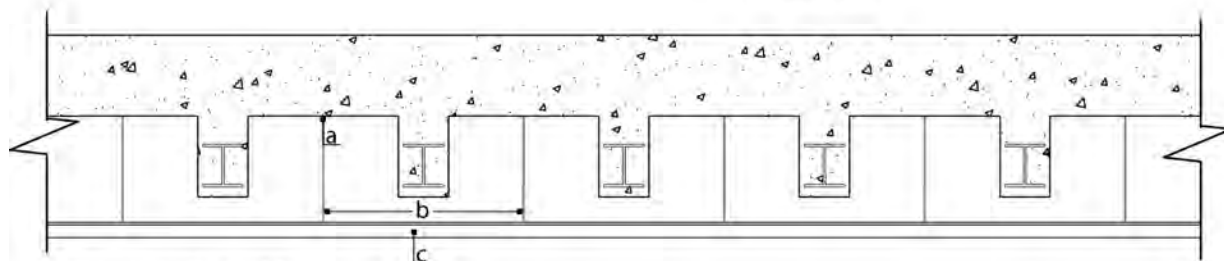
(a) expansion shields or other approved fastening not to exceed 4'-6" o.c.  
(b) 1/4"  $\phi$  or 1" x 1/8" hanger not to exceed 4'-6" o.c.  
(c) 1-1/2"  $\square$  cold rolled .475# carrying  $\square$  not to exceed 4'-6" o.c.



(a) beam clamp or approved fastening device not to exceed 4'-6" o.c.  
(b) 1/4"  $\phi$  or 1" x 1/8" hanger not to exceed 4'-6" o.c.  
(c) 1-1/2"  $\square$  cold rolled .475# carrying  $\square$  not to exceed 4'-6" o.c.

construction similar to:

- (1) open steel joist
- (2) concrete plank
- (3) bulb tee



(a) insert or approved fastening cast in slab not to exceed 4'-6" o.c.  
(b) 1/4"  $\phi$  or 1" x 1/8" hanger not to exceed 4'-6" o.c.  
(c) 1-1/2"  $\square$  cold rolled .475# carrying  $\square$  not to exceed 4'-6" o.c.

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- 

'republic arch'

- 

'metal deck'

- 

'wood joist construction'

- (a) 1/8" strap secured to wood joist with two (2) 2" anchor nails not to exceed 4'-6" o.c.  
(b) 1/4"  $\phi$  or 1" x 1/8" hanger not to exceed 4'-6" o.c.  
(c) 1-1/2"  $\square$  cold rolled .475# carrying  $\square$  not to exceed 4'-6" o.c.

902

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**R103.5 ASTM C 636, Section 2.1.6.** Delete Section 2.1.6 and replace as follows:

**2.1.6** Existing hangers shall not be used unless they comply, or are made to comply, with all of the provisions of this code relating to hangers.

**R103.6 ASTM C 636, Section 2.1.7.** Delete Section 2.1.7 and replace as follows:

**2.1.7** Carrying channels shall be attached to hangers in a manner that will prevent any vertical movement or rotation. If hangers are secured to special attachment devices that support the carrying channels, such devices shall have certified load test data from an approved testing agency and shall be capable of carrying four times the design load.

**R103.7 ASTM C 636, Section 2.2.3.** Delete Section 2.2.3 and replace as follows:

**2.2.3** Local kinks or bends shall not be made in hangers as a means of leveling the carrying channels.

**R103.8 ASTM C 636, Section 2.2.4.** Delete Section 2.2.4 and replace as follows:

**2.2.4** Carrying channels shall be designed to support the suspended loads, and shall be a minimum  $1\frac{1}{2}$  inches† deep (38 mm) cold-rolled steel channel weighing 0.457 pounds per linear foot (0.707 kg/m) and shall be given an electro-galvanized, hot dipped galvanized cadmium coating, or zinc coating.

**R103.9 ASTM C 636, Section 2.3.1.** Delete Section 2.3.1 and replace as follows:

**2.3.1** Main runners shall be installed such that they are level within  $\frac{1}{8}$  inch‡ vertical in 12 feet horizontal (1-percent slope) when the main runner is in firm contact with the carrying channel.

**R103.10 ASTM C 636, Section 2.3.2.** Delete Section 2.3.2 and replace as follows:

**2.3.2** Main runners shall be supported from the carrying channels. Direct hung suspension systems where the main runners are supported directly to the existing structure shall not be permitted indirect hung or furring bar suspension systems designed and installed in accordance with this code and utilizing carrying channels shall be permitted.

**R103.11 ASTM C 636, Section 2.3.3.** Delete Section 2.3.3 and replace as follows:

**2.3.3** Main runners shall be attached to the carrying channels in a manner that will prevent any vertical movement or rotation.

**R103.12 ASTM C 636, Section 2.3.4.** Delete Section 2.3.4 and Figure 2 and replace as follows:

**2.3.4** If the main runners are supported from the carrying channels by special devices, such devices shall be capable of carrying four times the design load. The devices shall be load tested by an approved testing agency that shall certify the devices are in compliance with this code. Such certifications shall be made available to the department and the applicant of record upon request.

**R103.13 ASTM C 636, Section 2.7.2.** Modify Section 2.7.2 to read as follows:

**2.7.2** Fixtures shall not be supported from main runners if the weight of the fixture causes the total dead load to exceed the deflection capability of the ceiling suspension system. Fixtures exceeding 80 lbs (36 kg) in weight shall be supported independent of the ceiling suspension system. Fixtures weighing 80 lbs (36 kg) or less may be supported from the carrying channels. Fixtures weighing 50 lbs (23 kg) or less may be supported from the main runners. Cross runners shall not be used to support fixtures.

**R103.14 ASTM C 636, Section 2.7.5.** Add Section 2.7.5 to read as follows:

**2.7.5** The construction documents shall show the necessary details of the acoustical ceiling to identify the number, size, spacing, location, weights, and types of fixtures and means employed to comply with these requirements.





# APPENDIX S

## SUPPLEMENTARY FIGURES FOR LUMINOUS EGRESS PATH MARKINGS

### SECTION BC S101 GENERAL

**S101.1 Scope.** The figures of this appendix shall supplement the provisions of luminous egress path markings in Section

1024 and are intended for illustrative purposes. Where there is a conflict between the figures and the provisions in Section 1024, the provisions in Section 1024 shall govern.

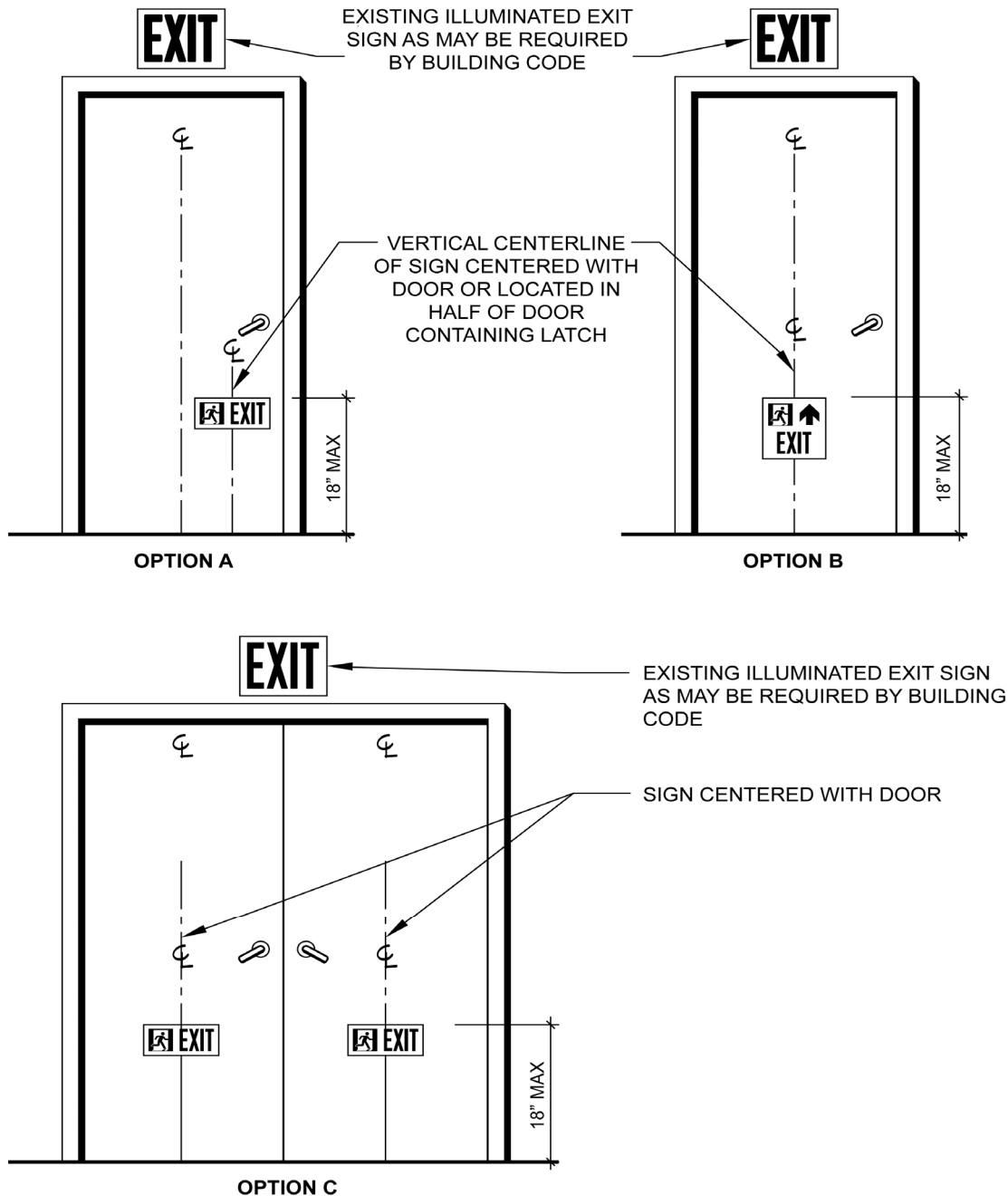


FIGURE S101.1(1)  
DOOR-MOUNTING OPTIONS FOR PHOTOLUMINESCENT DOOR SIGNS

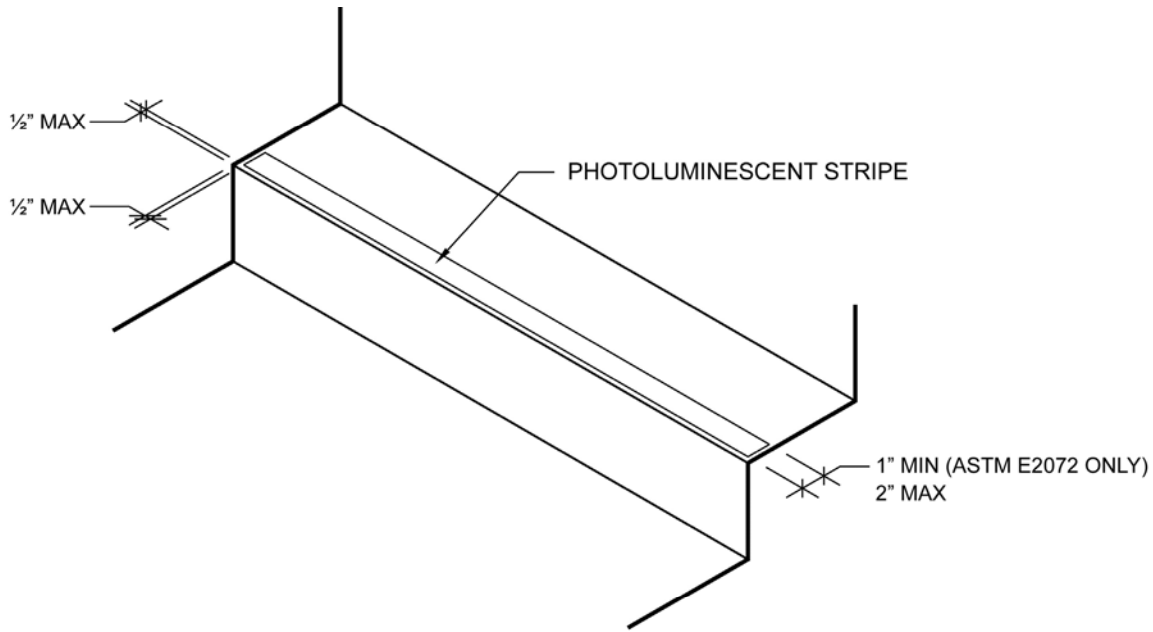


FIGURE S101.1(2)  
PHOTOLUMINESCENT MARKING AT HORIZONTAL LEADING EDGE OF STEP

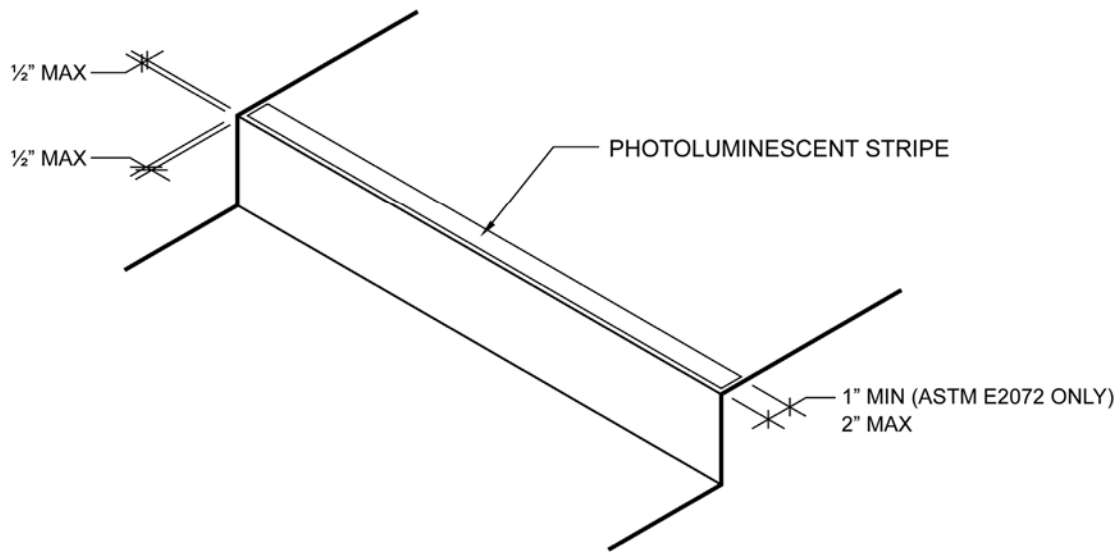
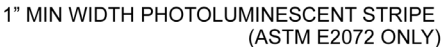


FIGURE S101.1(3)  
PHOTOLUMINESCENT MARKING AT HORIZONTAL LEADING EDGE OF LANDING



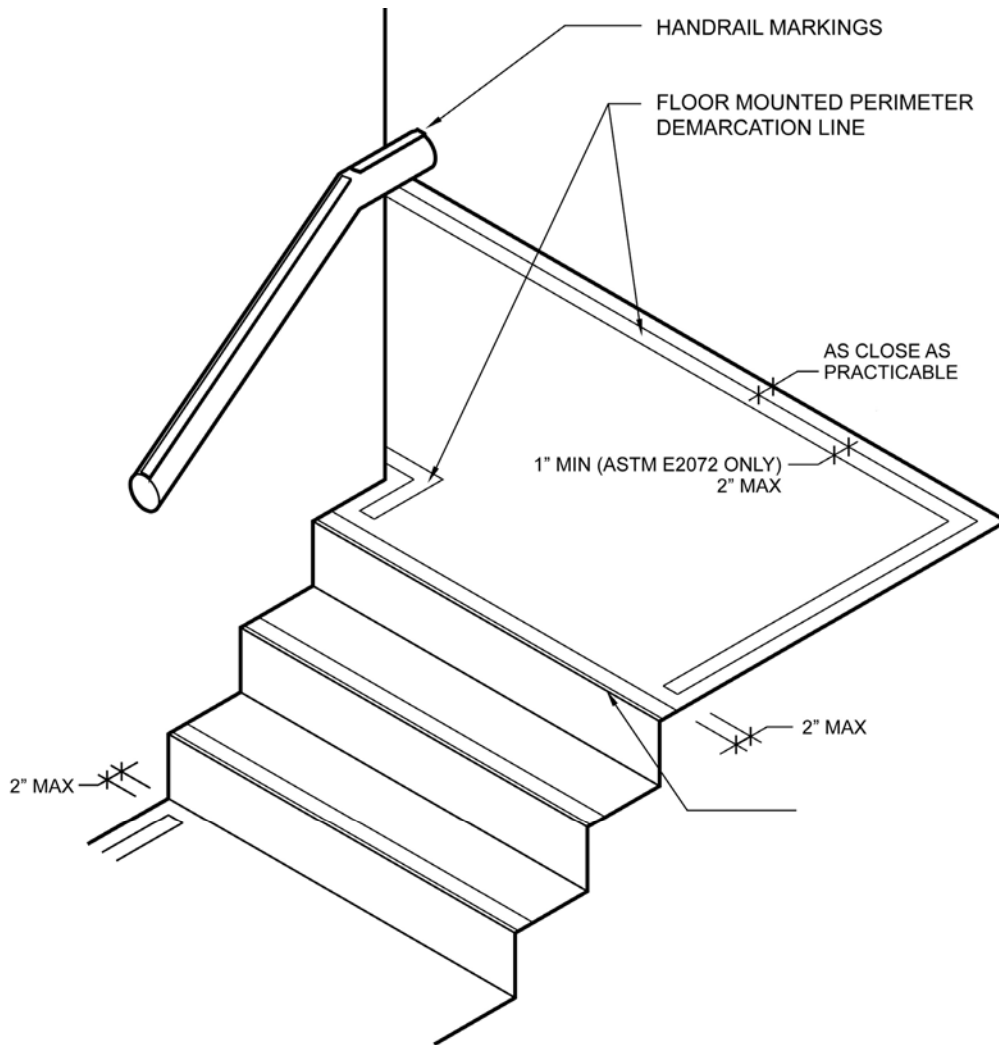
### CUT-AWAY ISOMETRIC OF HANDRAIL



## ELEVATION OF HANDRAIL

**FIGURE S101.1(4)**  
**PHOTOLUMINESCENT MARKINGS ON HANDRAILS**





**FIGURE S101.1(5)**  
**FLOOR-MOUNTING OPTION FOR PHOTOLUMINESCENT PERIMETER DEMARCATION LINES**



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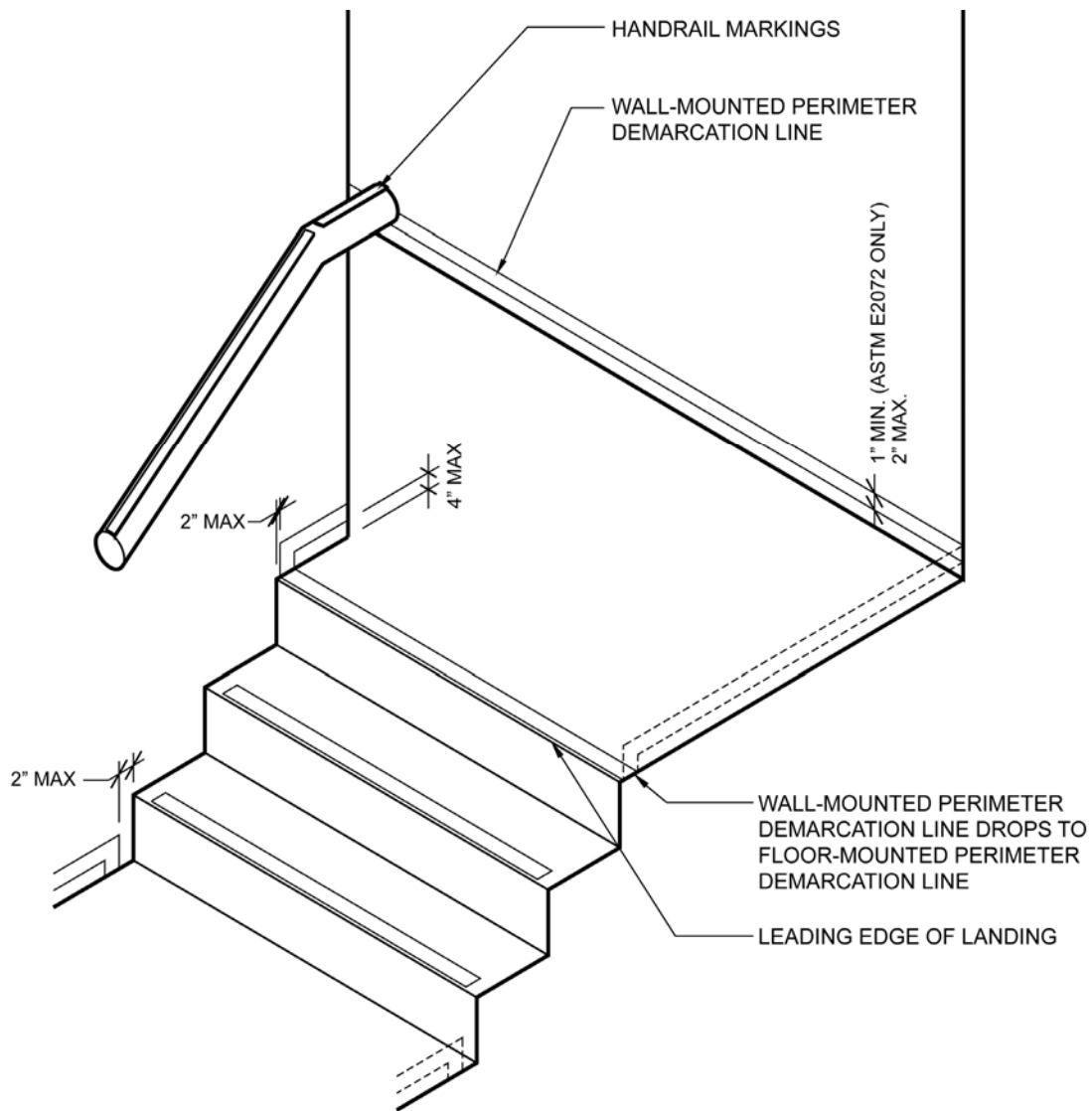


FIGURE S101.1(7)  
WALL-MOUNTING OPTION FOR PHOTOLUMINESCENT PERIMETER DEMARCATION LINES



**FIGURE S101.1(8)**



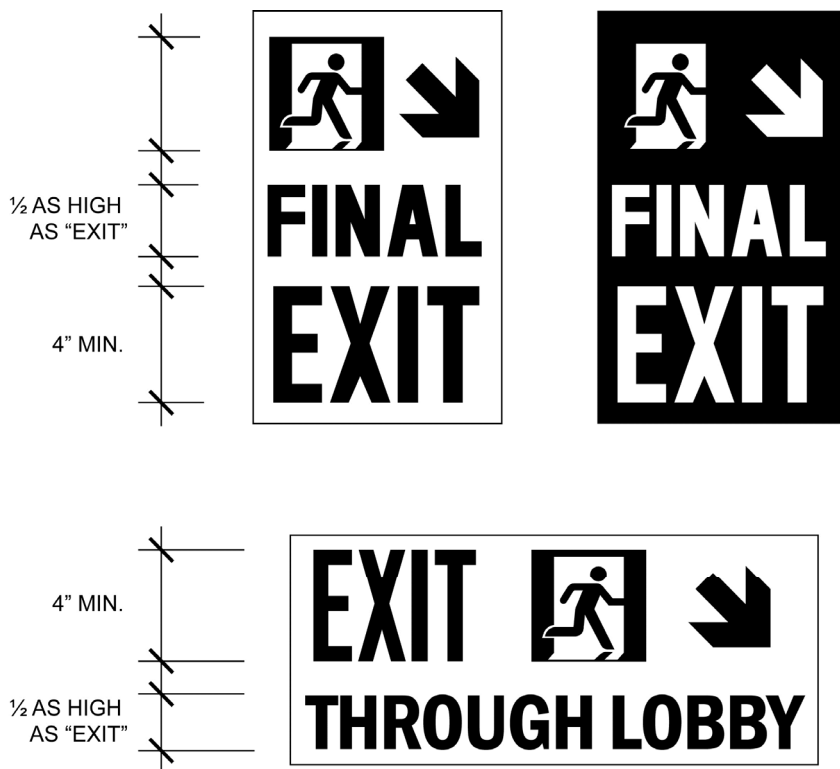
**FIGURE S101.1(9)**



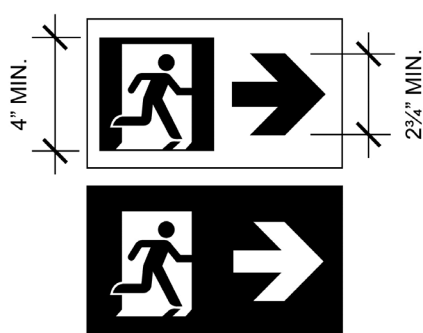
**FIGURE S101.1(10)**



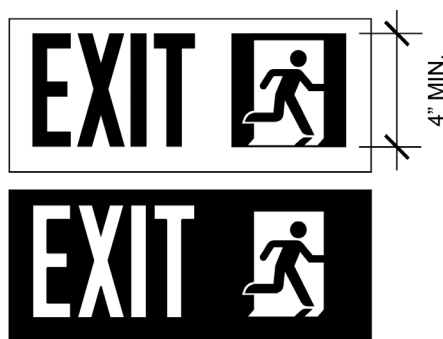




**FIGURE S101.1(13)**  
**PHOTOLUMINESCENT FINAL EXIT DOOR SIGNS**



**FIGURE S101.1(14)  
POSITIVE AND NEGATIVE OPTIONS  
FOR PHOTOLUMINESCENT  
DIRECTIONAL SIGNS**



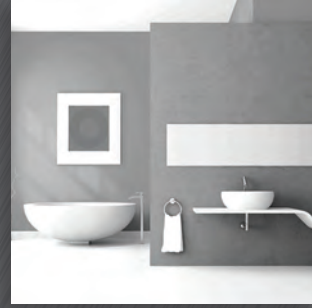
**FIGURE S101.1(15)  
POSITIVE AND NEGATIVE OPTIONS  
FOR PHOTOLUMINESCENT  
DOOR-MOUNTED DOOR SIGNS**



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